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A Conceptual Framework for Determining Training Needs of Extension Agentsapplied to Dairy Science.

Satish Verma
Louisiana State University and Agricultural & Mechanical College

A CONCEPTUAL FRAMEWORK FOR DETERMINING TRAINING NEEDS OF EXTENSION AGENTS APPLIED TO DAIRY SCIENCE

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Satish Verma
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Candidate: Satish Verma

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ABSTRACT

A training development procedure was synthesized from curriculum and learning theory with the object of identifying training need in relation to job specialization of Extension agents. The procedure was applied to the discipline of dairy science considering the job requirements of the generalist parish agent and the more specialized area agent in dairy work in the Louisiana Cooperative Extension Service.

Training need was basically interpreted in terms of discrepancy between present and expected cognitive ability in dairy science concepts. Overall, parish agents showed greater discrepancy than area agents. The latter had higher ability on three of nine discipline-cognitive level combinations, and 14 of 35 concept-cognitive level combinations; parish agents were superior on six concept-cognitive level combinations. There was little difference on the remaining combinations tested.

Job importance ratings of dairy science concepts were considered as an additional index of training need. Agents and subject matter specialists in dairy and veterinary science rated differently a number of concepts. Parish and area agents also differed in their ratings, but to a less degree.

It was concluded that the two types of agents had differential training needs which should be incorporated into in-service training programs, with specialists mediating needs and providing leadership.

Cognitive ability was related to a number of agent characteristics. Higher levels of ability in both types of agents were associated with lower age, fewer contacts with specialists and research staff, superior academic performance, and higher estimates by dairymen about their competencies. The pattern of relationship with regard to the remaining characteristics varied with the type of agent, parish and area agents invariably showing opposite correlations. Parish agents with higher ability, compared with those having lower ability, had longer tenure in Extension, dairy and supervisory work, had membership in more professional associations, referred to a larger number of information sources and journals, and received significantly higher ratings from specialists on specific job abilities. At the same time, they participated in fewer training activities, collaborated with a smaller number of professional associations, and spent less time seeking out new information. Area agents showed opposite correlations to parish agents on all these characteristics. The contradictory correlation patterns for the two agent types were ascribed to such personal/situation-oriented factors as inclination, time, opportunity, etc. It was thus inferred that agent characteristics, as a rule, could not be regarded as reliable indices of cognitive ability/training need.

A subsidiary objective of the study was to analyze the relative working of the parish and area systems of dairy work in Louisiana. The slight differences in the opinion of dairymen favoring the area system, and the significantly favorable attitude of dairymen in one of two Extension districts compared were not attributed to the influence of the area system, per se, as much as to the general working of the respective dairy programs.

CHAPTER I

INTRODUCTION

PROFESSIONAL DEVELOPMENT IN EXTENSION

It is generally recognized that pre-service training is, at best, an introduction to professional life. The social and educational changes which are taking place in society today at an increasingly accelerated rate render much of what we know obsolete much quicker than before. There is also much more to know, and there is increasing public scrutiny and demand to demonstrate higher levels of productive performance. In-service training programs, therefore, have to be the basic mechanism of professional growth.

Professionals in Cooperative Extension in the United States have all along realized the value of in-service training. State Extension Services organize programs of varying depth and variety in the technological and social sciences. These programs have been customarily developed on the basis of training needs in subject matter and program areas as seen by concerned professionals and/or supervisory-administrative personnel. This has been a useful means of curriculum development. Within the last few years, the National Extension Curriculum Development Committee, comprised of

University educators under the leadership of Dr. Ralph W. Tyler, has stressed the importance of the conceptual approach to learning, and has endeavored to develop conceptual frameworks in various subject matter areas and the underlying disciplines which are relevant to academic instruction in Extension Education. Leagens (49) has developed concepts in Educational Psychology; Copeland, Kaiser and Anderson (40) in Adult Education; Santopolo and Beggs (68) in Sociology; Perry (62) in Recreation Education; and McCormick, Cunningham and Bender (19) in Communication. In-service training programs in Extension could also focus on this kind of teaching approach in the future.

STATEMENT OF THE PROBLEM

Traditionally, Extension personnel in the United States have participated in the development of in-service training programs through an expression of their educational needs in broad subject matter and program areas.

Learning theorists postulate that a conceptual approach to learning increases learning efficiency and subsequent work performance. This principle has been followed in formal educational programs in the school and university systems. Academic Extension Education courses also reflect this trend. With regard to in-service Extension training programs, however, the conceptual approach has not been used to any significant extent. It appears logical that this

approach, which has been effective in academic learning situations, should be equally effective in in-service training programs. However, both training programs and research studies on these lines have been limited. Hence, a systematic study of the conceptual approach to curriculum development and training should provide useful procedures and guidelines for evaluating professional abilities and training needs in different subject specialties.

As in other agricultural enterprises, specialization in the dairy industry has been extremely rapid, resulting in fewer and larger dairy herds managed by better-informed and more innovative dairymen. Extension agents engaged in dairy work, therefore, have to be up-to-date on technological developments and should be able to help dairymen solve more complex and specialized problems.

In recent years, there has been a progressive movement towards the area or multi-county concept of personnel assignment in Extension. In Louisiana, the area system has been adopted in some subject areas, including dairying, over a portion of the state. The area dairy agent would appear to have a more specialized teaching role than the parish agent, who continues to be a subject matter generalist. The logical assumption is that the work requirements and training need of dairy concepts are related, among other things, to the level of specialization.

The purpose of this study is to extend the focus of the conceptual approach to learning from an academic setting to the

training of professionals in practical, field situations. This will be done by assessing the cognitive ability of dairy agents and relating this to a conceptually-based, need-oriented curriculum of in-service training.

OBJECTIVES OF THE STUDY

The major objective of the study is to synthesize relevant features of curriculum and learning theory into a conceptual framework for determining training needs of Extension agents and to demonstrate the application of this framework to the discipline of dairy science.

In reaching this major objective, the study has the following sub-objectives:

1. Determination of the present ability of dairy agents in terms of cognitive ability in dairy science and job effectiveness.

2. Analysis of cognitive ability of agents in terms of overall subject matter and discipline ability, and behavior level.

3. Relating overall cognitive ability to personal and professional characteristics and job effectiveness of agents.

4. Relating discipline cognitive ability of agents to job importance ratings of dairy science concepts.

5. Developing a behavior-content matrix of present cognitive ability of agents and comparing it with expected ability to indicate training need.

A subsidiary objective of the study is to compare the operational aspects of the parish and area systems of dairy work in Louisiana.

CHAPTER II

THEORETICAL FRAMEWORK

LEARNING

Learning is essentially a process of change. Gagne (6) defines learning as "a change in human disposition or capability, which can be retained and which is not simply ascribable to the process of growth."

Learning exhibits itself as a change in behavior. The change may be an increased capability for some kind of mental or physical performance. It may also be an altered disposition of the sort called "attitude," or "interest," or "value." That learning has taken place is usually inferred by comparing the behavior of the learner before and after being engaged in a learning experience. To be characterized as learning, the change has to be relatively long-lived and should not be a consequence of normal biological development.

An educational agency, whether the formal school-university system or the professional-in-service category, engages in two principal tasks. The first task is to decide, as far as is possible, how, as teachers and administrators, they want the student and/or professional to change and what part they can play in assisting him in the process. These decisions are the educational objectives of the

institution. The second task arises both as instruction unfolds and upon its completion; that is to determine whether the student has changed in the desired ways and to try to define what kinds of unanticipated outcomes have been achieved. This is the process of evaluation of the educational effort (2).

Educational objectives may be stated in various ways. Klausmeier and Goodwin (8) identified three ways: (a) as broad areas of curriculum content, (b) as outcomes of learning or "behavior changes," and (c) as development of human abilities. Bloom (1) and Krathwohl, Bloom and Masia (9) suggested the development of educational objectives according to a progression of behavior patterns. The cognitive domain involves intellectual tasks and the affective domain emphasizes emotional aspects of behavior.

The taxonomic classification indicated by these authors placed the behavioral aspect of the objective within an hierarchical framework: each category is assumed to include behavior more complex, abstract or internalized than the previous category.

COGNITIVE LEARNING

Cognitive Abilities as Objectives

Guilford (17) proposed a three-dimensional model for analyzing cognitive learning. Cognitive ability can be viewed as a combination of three dimensions: the intellectual operations or activities on the

part of the individual, the contents or classes of information to which the individual is exposed and the products of thinking that take place within the individual. The outcome of these interactions is improved, higher-level cognitive ability. The intellectual activities progress in complexity from cognition through memory, divergent production and convergent production to the level of evaluation. These processes parallel the hierarchical framework suggested by Bloom (1), wherein knowledge is the simplest cognitive process, followed in increasing difficulty or complexity by comprehension, application, analysis, synthesis and evaluation. Woodruff (12) and Gagne (6) have also indicated the hierarchical nature of cognitive learning processes. At the base of cognitive learning, Woodruff identifies subconscious, spontaneous conceptualization from perceptual experiences, which is similar to the stimulus-response, chaining and verbal association learnings of Gagne. At the higher levels, Woodruff recognizes thinking and application as inductive learning processes and analysis and creation as deductive in nature. Gagne's pyramid of learning progresses through multiple-discrimination learning, concept learning, principle learning and problem-solving ability.

In Bloom's taxonomy (1), knowledge implies "the recall of specifics and universals...methods and processes, or...a pattern, structure or setting...knowledge objectives emphasize most the psychological processes of remembering...." The National Society for the Study of Education (21) devoted its 1946 yearbook to the

measurement of understanding as opposed to rote memory. Understanding was operationally treated as any behavior from stating a proposition in words different from those of the original statement, through giving examples of a referent in a definition, to applying a principle in a situation new to the learner. Bloom classified the operations of understanding into five levels of intellectual skills and abilities.

Comprehension represents the lowest level of understanding. It implies the ability to translate, interpret and extrapolate from messages which are received as input and indicates a step beyond the verbalization of knowledge. The individual, according to Ebel (4), has, to some extent, a "command of substantive knowledge."

Application involves "the use of abstractions in particular and concrete situations. The abstractions may be... general ideas, rules of procedures or generalized methods...also technical principles, ideas and theories which must be remembered and applied."(2, p. 205) The individual acquires an intellectual independence and is able to cope with new problems and situations. The ability to apply implies behaviors such as being able to:

1. Determine which principles or generalizations are relevant or appropriate;
2. Explain new phenomena;
3. Predict what will happen;

4. Determine or justify a particular course of action or decision.

Analysis implies the breakdown of a communication into its constituent elements or parts such that the relative hierarchy of ideas is made clear and/or the relations between the ideas expressed are made more explicit. Bloom (2) indicates three behavioral dimensions of this ability to analyze--analysis or identification of elements, analysis of relationships or the connections and interactions between elements, and analysis of organizational principles which make and hold the communication together as a unit.

The process of putting together the elements or parts to form a whole is known as synthesis. This ability may be expressed when a unique communication or plan is produced or when abstract relations or propositions are developed.

Evaluation is defined as the making of judgments, quantitative or qualitative, about the value of materials and methods for given purposes. It involves the use of standards of appraisal and of criteria which may be determined by the individual or which are given to him. While the ability to evaluate is dependent on the individual's acquisition of prior types of learning, it includes in addition specific behaviors involving judgment and evaluation.

Concept Learning

A concept is a combination of the symbols, value and meaning,

which is individually and/or commonly associated with recorded experiences. Woodruff states:

> The human mind is the depository for all our experience. It has a way of storing experience, something like a motion picture record. This stored record makes possible the recollection of past experience almost as if it were happening again. The record is a concept and is a composite of meaning or understanding, feeling and the value and preference it produces and the symbols or language related to them. (12, p. 68)

Concepts are essentially non-linguistic because they are classes of experience which the individual comes to recognize as such, whether or not he is prompted or directed by symbolic language phenomena. Because the experience of individuals tend in many respects to be similar, their concepts are also similar, and through various processes of learning and socialization these concepts come to be associated with words. The "meanings" of words are the socially-standardized concepts with which they are associated (3).

Process of concept learning. Woodruff (12) recognizes five stages in the process of conceptual learning:

1. Perception. Perceptual experiences are formed.
2. Conceptualization. Accumulating perceptual experiences grow into concepts.
3. Thinking. Each new mental picture of something is checked against the pictures already in mind and worked into them or subsumed.

4. Evaluation. Mental pictures of things involved in a decision or line of action are drawn upon to determine choice.

5. Choosing. Those things are done which will bring about the desired results.

The essential characteristic of concept learning is the type of response that the individual makes to things or events. In concept learning, the individual progressively classifies stimuli or perceptual experiences into simple, general concepts, then to larger generalizations and finally as a comprehensive generalized concept. Through this type of learning, Gagne states that the individual can generalize or extrapolate the learned concept to other different stimulus situations that have not played a part in the learning itself (6).

Value of concept learning. Learning theorists and educationists agree upon the value of concept learning in promoting learning effectiveness and practical application and utilization of knowledge. Gagne (6) emphasizes that the acquisition of concepts in the concept learning process is what makes instruction possible and enables people to think and communicate with one another in "a common language." The individual is freed from the physical environment and is able to abstract ideas and link concepts into meaningful principles which are used in problem solving. Klausmeier and Goodwin (8) state that retention and transfer of information may

be more effective when the learner participates in discovering the nature of the concept and its applications. Contrasting the use of generalizations with the use of concepts in structuring social studies in secondary schools, Fenton states:

> Lists of concepts form a more useful notion of structure than lists of generalizations. Let us suppose, for example, that a student knows four concepts from sociology--class, status, role and norms--and wants to analyze the society of Boston in 1750...with them in mind he will search for evidence about class structure...He will try to find out what roles members of each social class played... which roles had high status and which ones ranked at the bottom of the prestige scale. Finally, he will seek evidence about which norms--patterns of behavior--were expected from everyone. The concepts are "imposed conceptions" which guide the search for data toward issues which sociologists have found useful for the analysis of society. (5, p. 14)

Concern has been expressed over conceptual orientation to learning in professional educational circles. According to Tyler (69), the professional person has to be helped to build concepts and understand concepts that are useful in guiding his own thinking about any process or content area. He emphasizes that there is much greater permanence of the usefulness of concepts than there is the particular facts. In discussing the kind of professional education that needs to be practiced, Tyler states:

> The conceptualization of learning as simply acquiring specific habits isn't adequate...we need a concept of education adequate for a person to carry on a job which will be changing all the time and where we cannot now predict what its nature will be, but for which we help him acquire some of the tools to think about and to examine the job.

> As he uses those, he will come to the point of being able to modify these concepts as he moves along in the light of new knowledge and...new experience....(75, p. 3)

In a similar vein, Carter (35) refers to orienting learning around the idea of concepts, which are open-ended. These concepts become tools for adding on details and experiences, so that they are continually refined and developed and become increasingly useful.

Evaluating Cognitive Abilities

Test procedures and materials have been developed and standardized for evaluating cognitive abilities of learners in formal instruction situations. With regard to informal education, particularly adults, evaluations are complicated by the nature and heterogeneity of the clientele, the informality and variety of learning situations and several other factors which are difficult to control. Consequently, it is difficult to develop standardized testing materials.

In the field of Extension Education, considerable research has been done on evaluation of certain levels of cognitive ability using empirically developed test instruments in specific situations.

In most studies, beginning knowledge and/or knowledge retained over a certain time period have been tested. In Louisiana, for example, Bradford (33) studied the association of knowledge of forestry concepts with selected forestry practices of small woodland owners, and Jones (51), Russell (67), and Swoope (73) studied

knowledge retention among 4-H dairy, swine and beef project members. Fugler (46) worked on the attitude and knowledge of farmers with regard to selected parish Extension Services. In the area of family living, knowledge studies were made by Davidson (42), Johnson (50), Sims (71), and Williams (81) in clothing, and by Gercke (47), Mitchell (59), Plovanich (63), Williams (80), and Walker (79) in nutrition. Creel (41) compared the relative effectiveness of two methods of teaching in aiding knowledge retention among 4-H club members.

The basic criterion of knowledge tested in most of these studies was the ability to recall or recognize information previously learned or taught in the study. Bradford, however, attempted to evaluate the full range of cognitive abilities, as classified by Bloom, although he preferred to designate these intellectual processes as knowledge (33).

Test procedures adopted in these studies consisted of series of subject matter questions designed to elicit knowledge recall or recognition. The tests were administered in formal groups, as with 4-H members, or by means of personal interview.

In contrast to the number of studies which have been done with Extension clientele, there has been practically no research on evaluating the cognitive abilities of Extension professionals. Agent performance reviews, using rating schedules of different kinds and empirically developed criteria, are the chief means and the closest

approximation to objective evaluation of professionals that can be found in the literature. For example, Casey (36) developed and evaluated an instrument for the performance review of county Extension agents in Oklahoma consisting of a comprehensive list of working tasks or items related to the agent's job and recommended principles and procedures for its use. He reported at the time that 13 states had used or were using evaluative techniques for reviewing the job performance of their personnel.

Khan (53) investigated the understanding of participants and non-participants in a program to improve the quality of instruction in the Ohio Cooperative Extension Service. He found a positive correlation between knowledge scores and position-rank in the organization. Experience in Extension work did not have any influence on knowledge. Respondents aged 30 to 49 years had higher scores than older or younger persons.

Performance evaluations have served the purpose of administrative and/or supervisory review of Extension personnel. Direct and in-depth assessment of critical intellectual behaviors in specific disciplines for purposes of professional improvement/training is not reported in the literature. The questioning of Extension professionals with regard to felt training needs has been the most common method of establishing, in an indirect manner, the levels of knowledge and skills.

CURRICULUM DEVELOPMENT

Curriculum inquiry designed to give immediate and direct assistance to ongoing processes of curriculum has been a compelling preoccupation of American educators. The 1926 yearbook of the National Society for the Study of Education, The Foundations and Techniques of Curriculum Construction (20), was concerned with existing problems, the aims of education and the objectives of schooling.

Some of the important curriculum questions of the past were:

1. In what way does knowledge of learners or subject matter or society contribute to curriculum construction?
2. What is the potential contribution of an educational philosophy to curriculum construction?
3. What is the potential contribution of a psychology of learning to curriculum construction?
4. How do patterns of curriculum organization affect the processes of instruction?

In 1950, Tyler (11) suggested a rationale for curriculum development based on four fundamental questions:

1. What educational purposes should the school seek to attain?
2. What educational experiences can be provided that are likely to attain these purposes?

3. How can these educational experiences be effectively organized?

4. How can we determine whether these purposes are being attained?

Tyler's framework is an excellent rationale for the practitioner to examine his problems and find answers which will define a curriculum. It indicates an initial value position with regard to educational objectives, then suggests logical comparison and organization of the several means of reaching these objectives. Self-correction is inherent in the evaluative process, within the limits set by the selected objectives.

Walker (78) has recently presented an empirical model of the process of curriculum development. He asserts that, in essence, a curriculum project transforms an initially vague, unsystematic but strongly held vision of the educationally desirable into a concrete educational program. This transformation is accomplished first by attaining agreement on a platform--a body of shared beliefs about curriculum. Then using this platform, the project staff develops a plan of work, the completion of which requires discussion, debate, argument or deliberation on crucial issues, and finally the production of curriculum materials. While the Tyler model regards objectives as an essential starting point, without which learning experiences cannot be rationally selected and assessed, the proposed empirical model views objectives as only one means among others for guiding

the search for better educational programs. They are not a starting point but a late development of the curriculum maker's platform.

Most curriculum questions can justifiably be placed within Tyler's framework or legitimately be translated in his terms. According to Goodlad (16), "Tyler put the capstone on one epoch of curriculum inquiry, and...dramatized the need for another;...theory building through the construction of conceptual systems." Whatever refinements or improvements may be made in the future in the field of curriculum theory, the essential value of the Tyler model as an integrative means of conceptualizing educational programs will probably remain undisputed.

Educational Objectives in Curriculum Development

The importance of carefully defined educational objectives for the improvement of curricula and instruction is central to the work of leading educationists.

In Tyler's rationale, statements of objectives serve as the criteria or standard by which content is selected, instruction is planned and evaluations are conducted. Though Tyler's approach includes evaluation of instruction in progress, the main emphasis is summative--appraising how well objectives have been attained at the end of a course or curriculum.

He suggests the construction of a table of specifications as a

model of instruction and evaluation. Curriculum objectives are presented in the form of a behavior-content matrix. Each behavior is listed along one dimension and the different content areas are specified along the second axis. The intersection of each behavior (B) with each content area (C) results in a chart composed of C x B or N behavior-content cells. Each cell of the specifications matrix is a summative objective, and the learner's attainment of the objectives is evaluated at the end of the course curriculum or sequence.

On the other hand, investigators like Gagne (6) and Mager (10) have been interested in why rather than whether an instruction program works or fails to work. Such an orientation allows for the improvement of the instructional package while it is in the developmental phase and avoids the necessity of introducing radical changes into a completed program. Thus, from the point of view of evaluation, the emphasis is primarily formative rather than summative.

The task analysis approach was employed by workers interested in formative evaluation. This approach describes the terminally desired skill and then analyzes it into a "repertoire of hierarchical behaviors." Students are evaluated on whether or not they can correctly perform each of the behaviors subordinate to the final task.

The approaches of the task analysis school and the Tyler school supplement and complement one another despite their differences in emphasis. For example, Tyler stops at a description of the desired behavior, whereas task analysis goes on to prescribe a very detailed

behavior repertoire. Tyler's approach does not require the specificity which Gagne's entails in his description of each small step in the instruction program.

The two points of view are in agreement, however, that any instruction program has as its goal helping students to change their behavior; the student must be able to do something after instruction that he could not do before. Further, they agree that the degree of success of a program must be assessed, and this can be done only by a measurement of student performance; hence the objectives must be stated in terms which are operational, involving reliable observation and allowing no leeway in interpretation.

Deriving Educational Objectives

Tyler identifies three sources of information to provide wise and comprehensive decisions about objectives. These sources are the learners, contemporary life and subject matter specialists.

Studies of the learners themselves is a logical starting point, which will identify needed changes in behavior patterns of the students which the educational agency should seek to produce. Comparing information about the learner with some desirable standards, some conception of acceptable norms, will reveal discrepancy. This difference or gap is what is commonly referred to as a "need." This meaning of need should be distinguished from the interpretation of psychologists who consider needs as tensions in the organism which

must be brought into equilibrium for a normal healthy condition of the organism to be maintained.

The analysis of contemporary life has been advocated in order to focus educational efforts upon critical aspects of a complex, rapidly-changing society; secondly, to relate learning activities to actual life conditions and opportunities. The "logic" is somewhat similar to the argument for job analysis, in which the activities carried on by a worker in a particular field are analyzed in order that training activities can be focused on the critical ones.

Suggestions from subject matter specialists and the relevant disciplines are important in establishing desirable standards of behavior and content in the particular subject area. In addition, specialists can provide ideas about the particular contributions that a subject can make to other large educational functions.

In-Service Training

In-service training programs for professional staff have been based, among other criteria, on self-expressed needs. Various authors have recognized the value of this concept. Tyler suggested that "student interests" is a critical starting point in developing a curriculum. Halsey (7) and Dunbar (25) recommended a systematic, careful study of staff needs to indicate the areas of training by Extension. Jackson and MacKinney (27) postulated greater staff acceptance of training programs when they actively participated in

its determination.

In addition to inventory of self-expressed needs, the behavior-content of training programs can be determined by directly evaluating the job performance and/or abilities of professionals and indirectly by supervisory assessments.

The techniques which have been employed to develop in-service training programs are surveys of training needs using mail questionnaires and/or personal interviews, observations of job performance, job performance evaluations, and identification of critical behaviors. Instruments to test intellectual skills and abilities in subject matter have not been used.

Training of Extension Staff. The role of in-service training in improving and upgrading the competencies of Extension personnel has been continuously stressed in policy statements of the Federal and State Governments. The 1968 Report of the Joint Study Committee of USDA and the National Association of State Universities and Land Grant Colleges, entitled "A People and a Spirit," reiterated the importance and need of continued professional competence to meet the unique and complex educational needs of Extension's clientele in the future (18). The Subcommittee on Staff Training and Development of the Extension Committee on Organization and Policy (15), in a national policy statement on administrative arrangements for training, recommended that each Extension organization should assign one or

more staff members the responsibility for staff development programs. This staff would identify training needs, recommend training policies, and arrange learning experiences to meet these needs. It recognized the importance of induction training, in-service training and graduate study in a total program of staff training and development.

The several studies of identification of educational needs and interests of Extension agents in the United States over the past 20 years have been oriented towards general subject matter, job analysis, recommendations of the National Task Force Report on Extension In-Service Training (15), the major program areas of the Scope Report (14), and the document, "A People and a Spirit" (18). Such studies have been made by McCormick (57) and Mount (60) in Ohio; Clifton (38), Cook (39), Hill (49), and Matthews (56) in Texas; Abdul-Hadi (30), Serate (69) and Sughrue (72) in Kansas; Clark (37), Vandeberg (77), and Wilson (82) in Wisconsin; Price (64) in Arkansas; Ussery (76) in Tennessee; Flint (45) in Louisiana; Sherer (70) in Alabama; Bajaj (31) in Oklahoma; Eckard (43) in Colorado; Halsted (48) in Wyoming; Peabody (61) in Michigan; and Findlay (44) in New York. Kalangi (52) has also analyzed the training needs of Extension agents in urban and farm counties in several states.

Various procedures have been followed in these studies for identifying training needs. Wilson (82) sought agent reaction to subject matter course content, while Leagens (54) used literature review and discussion with key individuals and educational

administrators. Matthews (56) developed a set of criteria expressed in terms of knowledge, skills and attitudes needed for effective job performance and obtained agent responses on relative importance and relative training need. Findlay (44) used the critical incident technique to identify areas of behavior in which professionals needed competence and then attempted to link this behavior to a related structure of concepts which would serve as logical teaching/learning objectives. Peabody (61) classified critical incidents reported by agents into a performance category system and analyzed the ranking of categories according to position and tenure.

The procedures indicated above have attempted to gain an insight into training needs through indirect means. The conceptual approach to learning analysis has been reported by only one investigator and here also the conceptual structure was indirectly inferred from related behaviors. There has, therefore, been limited research on the conceptual delineation of different disciplines and the direct assessment of professional competencies related to discipline concepts.

The importance of the conceptual approach to learning has been referred to earlier. Since it has been shown to promote better understanding, it will be appreciated that this approach has greater value in practical situations involving higher level cognitive abilities, such as problem-solving. Fields of work which require a strong, practical base, as does Extension, would, therefore, be benefited if

professional training emphasizes the conceptual approach. The following steps are indicated in adopting this approach:

1. Development of conceptual frameworks for the different disciplines comprising basic or core concepts and applied concepts derived from underlying fundamental disciplines, as well as applied fields.
2. Relating concepts (content) to specific intellectual behaviors (cognitive needs) using either the task analysis approach or the two-dimensional matrix to arrive at educational objectives, which are operationally defined and capable of evaluation.
3. Organizing instruction.
4. Conducting summative and/or formative evaluation of the objectives, using direct and/or indirect procedures of assessment of cognitive abilities.

THE AREA CONCEPT

Increasing specialization is one of the major trends in the American occupational structure. In Extension Service, this trend is supported by the needs of commercial farmers and other clients for information that can be provided most effectively by subject matter specialists. The area concept of personnel assignment has been adopted in many states in response to this trend.

Projecting into the 1970's, the Joint USDA/NASULGC Extension Study Committee indicated that "...area programming may become a more practical approach than county programming. Local offices should be structured on a multi-county basis whenever such an arrangement offers a more efficient means of carrying out programs." (18, p. 73)

Some Experiences

While the soundness of the concept from the competence standpoint is generally accepted, concern has been expressed with regard to organizational problems and client response.

Woeste (29) compared decision-making behavior of selected county and area agents in Indiana and Kentucky in relation to their use of time. He designated most decisions of county agents as programmed-routine in contrast to innovative decisions of area agents. As evidence of this, he indicated that area agents spent more time making farm and home visits and preparing for teaching situations and less time on telephone/office calls. Barnett and Louderback (24) investigated the sources of satisfaction and dissatisfaction experienced by Kentucky Extension staff who were involved in organizational change towards the area specialist with multi-county responsibility. The development of intellectual skills and abilities, a sense of responsibility and independent achievement were quoted as most satisfying factors. The major source of dissatisfaction with regard to the

clientele was a lack of understanding on the part of county clientele and increased demands from area clientele.

Slocum (28) suggests that there is an essential conflict in the role of the area agent. Organizational expectation is increased competence. This can be achieved only at the expense of decreased identity with local social systems. He feels that the area agent approach is a temporary solution because it may hinder rather than facilitate the crucial relationships of the area agent with both of his reference groups--the community and his work organization.

With regard to client relationships, Campbell (34) in Oklahoma and Ross (22) in Kansas studied attitudes of local influentials toward the area system. In general, county commissioners appeared to disfavor the system mainly owing to the fact that the identity of the agent with the county was lost. Young farmers with large operations tended to be in favor. County commissioners in the Oklahoma study recommended appointment of area agents in addition to the existing county staff. The Kansas study suggested prior legitimation of area positions with the community leadership. McIntyre (58) compared the effectiveness of area and county programs in Indiana using an awareness-satisfaction scale. He observed that Extension cooperators in the county system were more satisfied, participated at a higher level and adopted more practices than those in the area system. No differences were found when the farmers were randomly chosen.

The Area System in Louisiana

The area system was introduced in the Louisiana Cooperative Extension Service as early as 1948 in forestry. Expansion into additional subjects and over a larger area has been done in the past five years. At the present time, the system is in operation in two of the three Extension districts into which the state is divided, namely Northern and Southeastern.

Area dairy agents have been working in these districts for about five years and are responsible for servicing over two-thirds of the commercial dairy farmers in the state. The remaining one-third are located in the Central Southwestern District, which has only parish dairy agents.

LEARNING AND CURRICULUM THEORY APPLIED TO THE STUDY

The Extension agent engaged in dairy work in Louisiana will be the central focus of the study. Drawing on learning theory, an attempt will be made to assess the cognitive ability of dairy agents in the discipline of dairy production. This measure of cognitive ability will be used to test the validity of the area concept with regard to subject matter competence and program effectiveness. Tyler's curriculum development model will be integrated with this analysis of cognitive ability to indicate how educational objectives for in-service training may be developed.

CHAPTER III

RESEARCH DESIGN

THE RESEARCH MODEL

The research model used in the study combined features of curriculum and learning theory. This model is shown in Figure 1 with the basic elements and their inter-relationships.

The ultimate purpose of the study was to apply the research model as a conceptual framework to demonstrate how objectives for an in-service training program may be derived. The basic assumption adopted was that Tyler's concept of need is the most useful and practical indicator of the behavior-content dimensions of objectives.

Need was established by evaluating the discrepancy between expected ability and present ability of learners--in this study, dairy agents in Louisiana.

A consensus of expected ability was determined by obtaining reaction and/or information from two sources. The first source was the contemporary dairy world (contemporary life in the Tyler model) indicating the degree of technological development and specialization desired in agents in educating dairy clientele. The second source comprised the discipline-specialist combination which yielded

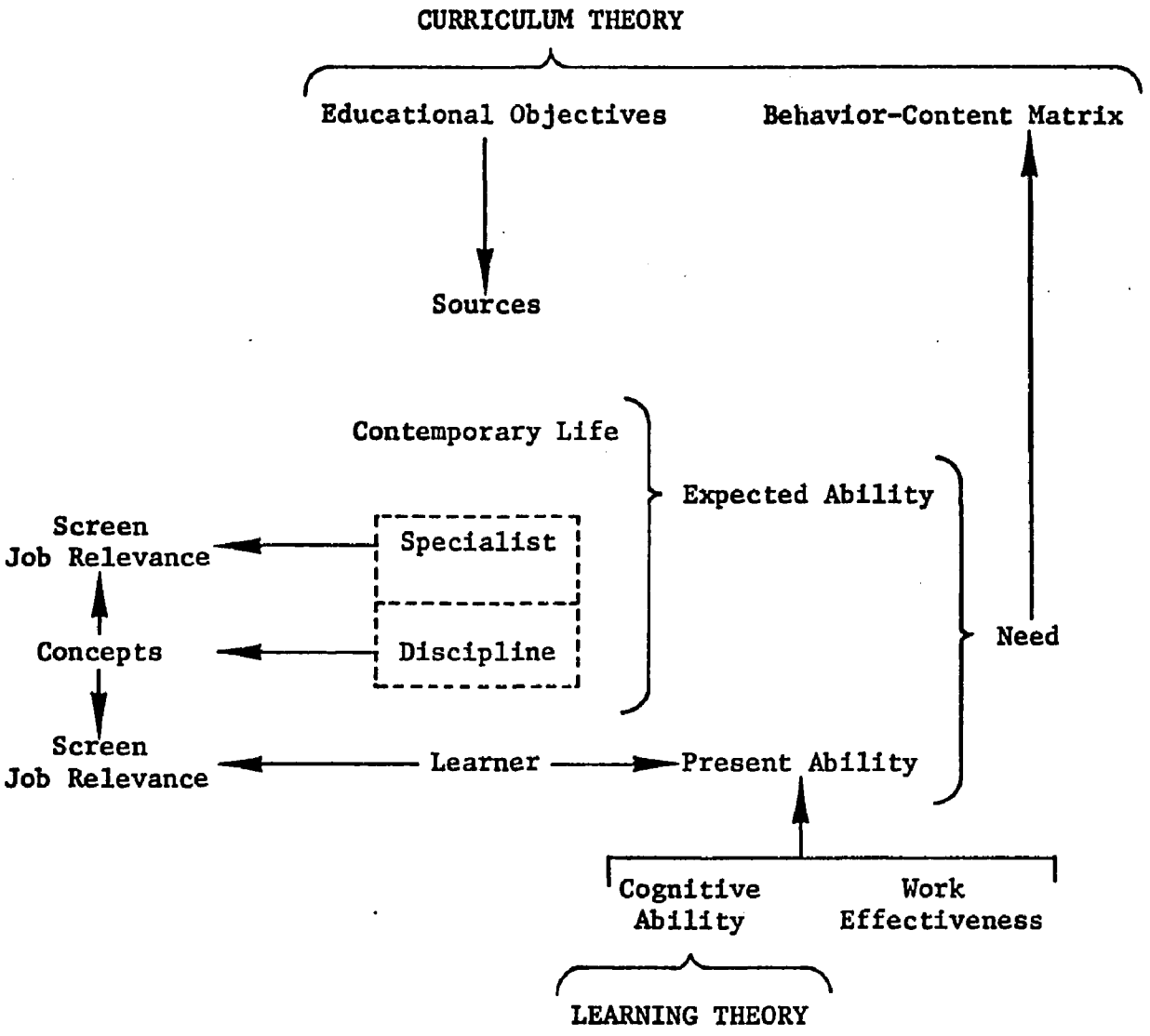

Figure 1. The Research Model

conceptual frameworks in dairy cattle breeding and physiology, nutrition, and management and which dairy agents should ideally possess as a part of their intellectual repertoire. These conceptual frameworks were developed in three stages:

1. Identification of concepts:
   (a) Study of published materials--textbooks, scientific publications and popular magazines--in the three areas indicated.
   (b) Reference to research authorities.
2. Grouping of concepts:
   The identified concepts were grouped into meaningful categories headed by major concepts, followed by associated sub-concepts.
3. Screening of concepts:
   The concepts were screened firstly by the author on the basis of his conception of relevance to the job of the dairy agent. Thereafter, the state Extension specialists in dairy and veterinary science screened the concepts on a rating scale of value, using the criterion of importance of these concepts to the dairy agent in his job. Essentially, therefore, the screen used was that of job relevance.

Present ability of dairy agents was basically measured by finding out cognitive ability in terms of the knowledge-evaluation hierarchy of Bloom using a mix of subject matter questions. Indirect

evaluations of agent ability were also obtained from the state Extension specialists and dairy farmers in their area of operation to add a dimension of job effectiveness.

METHODOLOGY

Sources of Information

Extension agents, state Extension specialists and dairy farmers comprised the three groups of individuals from whom information was collected.

Extension agents provided the basic information on which the study was developed. Twenty agents were included. Of these, seven agents, designated area agents, were working exclusively or almost exclusively on dairy work covering 18 parishes in the Northern and Southeastern Districts. The remaining 13 agents were selected from the Southeastern and Central-Southwestern Districts in parishes having either a minimum of 15 commercial dairy herds or 1,000 commercial dairy cows. In all, therefore, agent work in 30 out of the 64 parishes in the state affecting 96 percent of the commercial dairy clientele was reflected in the study.

There were four dairy specialists and one veterinary specialist in the State Office. These specialists were included in the study to provide evaluation of agent effectiveness.

There were 1716 commercial dairymen in the parishes served

by the agents in the study. Of these, 1384 were serviced by the area agents and 332 by the parish agents. The list of dairymen with the Louisiana Animal Breeders Cooperative was randomly sampled. Four hundred questionnaires were sent and 86 returned. This made a sample of 4.8 percent. Information obtained pertained to various aspects of the dairy program. From this, the relative operation of the parish and area systems and the attitude of dairymen in the area system towards the area concept were inferred.

Collection of Data

Information was gathered by mail questionnaire from the agents and dairymen and by a rating schedule from the specialists.

The questionnaire for agents consisted of three parts (Appendix A). Part 1 contained questions about education and in-service training undergone by the agent, experience in Extension work, contact with specialists and information-seeking habits. Part 2 listed series of major and sub-concepts in the disciplines of dairy cattle breeding and physiology, nutrition, and management. The reaction of agents to each of these concepts in terms of its importance in their work was sought on a five-point scale from "absolutely essential" to "little value." Part 3 contained questions aimed at evaluating three levels of cognitive ability--(a) knowledge, (b) comprehension-application, and (c) analysis-synthesis-evaluation.

These questions were developed in accordance with the

behavioral criteria identified by Bloom, Hastings and Madaus (2). For example, knowledge was inferred by asking the agent to match definitions with concepts A 1-15 (Appendix A, Part 3, Section A). The ability to comprehend and apply a concept was sought in a question like C 3 (Appendix A, Part 3, Section C) on heritability, in which the agent was confronted with the task of comprehending (interpreting) the concept and applying it to situational uses. The third level of cognitive ability was inferred from a question like C 15 (Appendix A, Part 3, Section C), where several nutrition concepts had to be understood and used in a new situation to come up with a unique logic.

The questionnaire for dairymen was directed towards various aspects of the dairy program, both in a general manner and specifically as affecting them. The questions were intended to evoke opinions on the general effectiveness of the dairy program which could be construed as a reflection of agent ability. Dairymen in the area system were also asked to react to the area concept, as it had functioned, so as to get an idea about their attitude.

Specialists were asked to rate each agent on a five-point scale in terms of (a) how effective their parish/area dairy programs had been, and (b) knowledge and comprehension of subject matter related to various aspects of dairying. The specialists were provided with the same series of concepts given to the agents and asked to rate each concept according to their perception of importance in the job of the agent.

Analysis of Data

Major analytical dimensions. There were three major dimensions of analysis. The first was concerned with the cognitive ability of agents and its relationship with agent characteristics and specialist-dairymen evaluations about the effectiveness of the agents and their programs. Another major focus of the study was congruence of the views of agents and specialists regarding the importance of selected concepts in the job of the agent. The relative operation of the area and parish systems as inferred from the opinion of dairymen formed the third dimension of the study.

Agent cognitive ability was studied from two viewpoints--(a) subject matter-overall and discipline, and (b) cognitive level.

Scores for these three dimensions of cognitive ability were computed from the responses to the questions in Part 3 of the questionnaire for agents. The questions were categorized into three levels of cognition within a discipline, requiring an increasing degree of intellectual attainment to provide the appropriate response. The responses were weighted on a 2-4-6 scale corresponding to the three levels. Based on test performance, overall scores and discipline scores in breeding, nutrition and management were computed for each agent. The maximum overall score was 170 points and the maximum discipline scores were 58 points in breeding, 56 points in nutrition and 56 points in management. With regard to cognitive level,

the questions were classified into three levels of intellectual ability of the concepts within a discipline. The responses to the questions were evaluated and average score(s) for sampled cognitive level(s) of the several concepts were computed.

The relationships between these dimensions of cognitive ability and selected variables are shown in Figure 2.

Mean overall cognitive ability of area and parish agents was related to their personal and professional characteristics and to job effectiveness ratings by dairymen and specialists to test for significant association. Most of these variables were continuous, either in themselves, for example, age, or by virtue of numerical scores assigned to them.

Discipline scores of cognitive ability of parish and area agents were tested for significant association with agent ratings of the job importance of discipline concepts and specialist ratings of subject matter ability of the agents.

Ability scores of parish and area agents by cognitive level of the several concepts within a discipline were analyzed to test for significant differences. These scores were used to develop a behavior-content matrix reflecting the present cognitive ability of the two types of agents with the object of matching with expected ability and determining training need.

In the second dimension of the study, the ratings by agents and specialists of selected dairy science concepts with regard to their

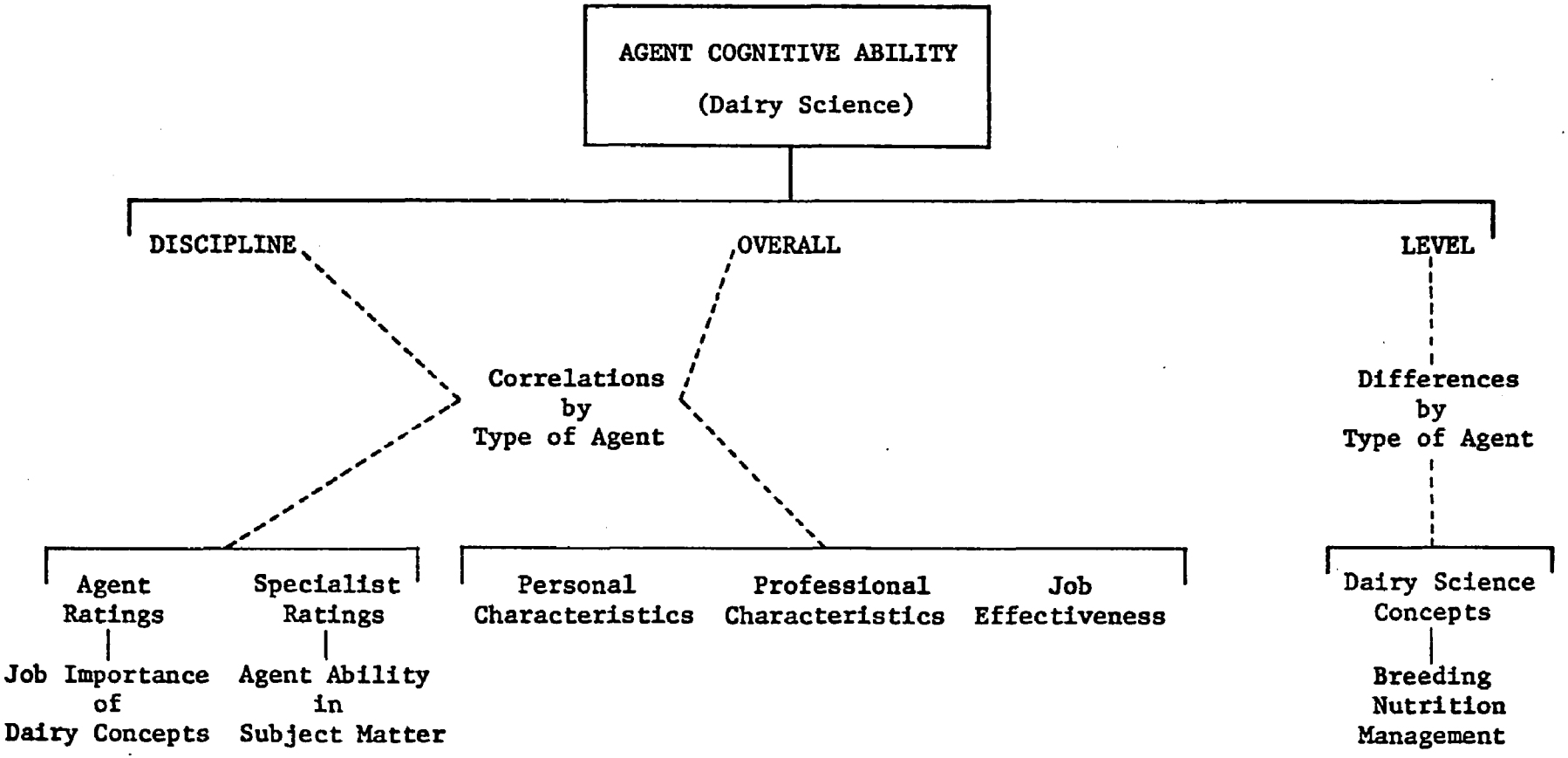

Figure 2. Dimensions of Agent Cognitive Ability and the Relationships Studied

importance in the agent's job were analyzed to see how close these professional groups came to one another.

The third analytical dimension related to the study of (a) the relative operation of the area and parish systems of dairy work as inferred from the opinion of dairymen, and (b) the attitude of dairymen in the area system towards its working. Relative operation of the two systems was primarily related to agent effectiveness. Several indices were examined, as shown in Figure 3. The attitude of dairymen in the Northern and Southeastern Districts was analyzed to see if there was any significant difference.

Quantification of Data

A number of variables used in the study were quantified using the information obtained from the three categories of respondents. A graduated scale of values, ranging from one through three, four, or five--depending on the item of information involved--was primarily used in all cases. In some cases, raw scores were used and, in others, average scores were computed.

The variables quantified in the above manner are indicated with the elements that were used to compute them.

1. Overall or total program. Average scores based on ratings of agents by dairymen and specialists regarding the effectiveness of different aspects of the dairy programs in the parishes and areas

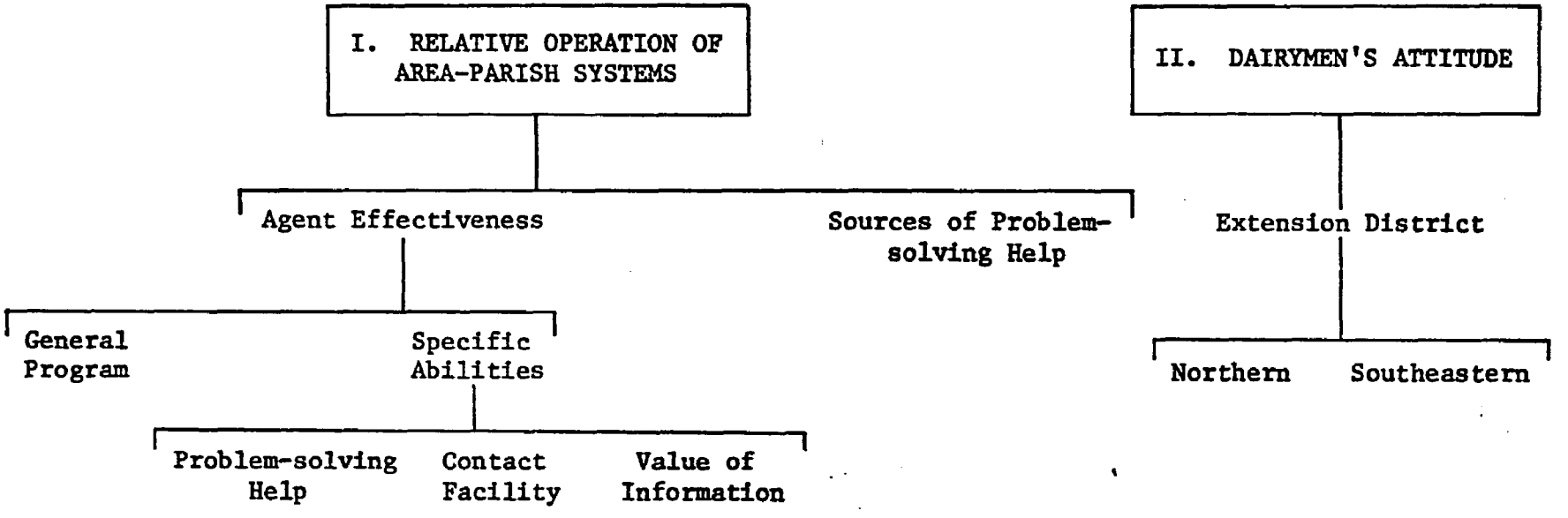

Figure 3. Analysis of Area Dairy Work in Louisiana

included in the study.

The overall program ratings of dairymen were made up of five components, namely, the general parish program, problem-solving decisions for individual dairymen, help sought from agents, facility of contact with agents and value of the information received from them. There were 28 elements in these five components. Each of these elements was scored and averages obtained for the components based on the number of elements and the number of responses by dairymen in each component. The maximum score for each component was five and for the overall program 25.

Specialist ratings of agents' programs were based on problem identification and planning abilities and on feedback from dairymen and carried an average maximum score of 15.

2. Specific abilities. Specialist ratings of agents with regard to problem identification and planning, innovativeness, and knowledge and comprehension of subject matter.

3. Professional contacts. Additive and/or weighted scores of agent contact with specialists and researchers and with associations and organizations.

4. Information seeking. Weighted scores of agent use of information sources and magazines.

5. Job importance ratings. Concepts in the three disciplines,

namely, breeding, nutrition and management were rated by agents and specialists in terms of importance for the satisfactory performance of the agent's job. Each discipline had a set of major concepts and sub-concepts. Each sub-concept was assigned a score from one through five--depending on the degree of essentiality indicated by the rater. The scores for all sub-concepts relating to a major concept were averaged, so that a score of five was possible for a major concept. The average scores received by the major concepts in a discipline were then summed. The maximum scores were 30 in breeding, 40 in nutrition, and 55 in management. The overall possible score for all three disciplines was 125.

Statistical Analysis

The data on mean overall and discipline cognitive ability of agents was related to the several variables indicated earlier using simple linear correlation to test for significant association between agent performance on one hand and agent characteristics and specialist-dairymen evaluations on the other. Discrete variables like field of specialization and extent of information seeking by type of agent were tested for differential ability using factorial analysis.

Cognitive behavior levels of agents and importance ratings by agents and specialists of dairy science concepts were tested for significant differences among the various professional types by one-way analysis of variance.

The data collected from dairymen was analyzed for differences in relative operation of the area-parish system by the chi-square technique and for attitudinal differences between dairymen in the two Extension districts by the chi-square and one-way analysis of variance procedures.

Statistical significance was indicated at the level found. The minimum level of significance used was .25.

DEFINITIONS OF TERMS

1. Parish dairy agent. An Extension agent in the single-parish system of personnel assignment who devotes significant proportion of his time to dairy work, the selection criterion being a parish with at least 15 commercial dairies, or 1,000 commercial milk animals.

2. Area dairy agent. An Extension agent in the single-parish or multi-parish system of personnel assignment who has major or sole responsibility to dairy clientele.

3. Concept. A fundamental idea which describes a phenomenon or a class of experiences and provides a base of cognition and generalization.

4. Conceptual framework (discipline). A set of major concepts and sub-concepts developed in a discipline through the process of

identification, grouping, and job relevance screening. In this study, conceptual frameworks were developed in three major disciplines: (a) Dairy Cattle Breeding and Physiology, (b) Dairy Cattle Nutrition, and (c) Dairy Cattle Management.

5. Conceptual framework (training). A rationale combining selected features of curriculum theory and learning theory for analyzing training needs.

6. Cognitive ability. An index of the knowledge-evaluation hierarchy of cognitive behavior of dairy agents in regard to dairy science concepts. Three dimensions of cognitive ability are defined--overall subject matter, discipline, and cognitive behavior level.

7. Expected ability. An expression of the cognitive ability ideally desired in agents.

8. Present ability. A composite of cognitive ability of agents as tested and job effectiveness as seen by specialists and dairymen. Used synonymously with cognitive ability.

9. Job importance ratings. An index of the importance of single and clusters of dairy science concepts in the work of dairy agents as seen by agents or specialists.

10. Information-seeking. An index of the active disposition of the agent towards obtaining scientific information from different sources.

11. Job effectiveness. Comprises two dimensions: (a) assessments by specialists and dairymen of the general effectiveness of dairy programs of parish and area agents, and (b) specialist evaluation of specific abilities of agents.

CHAPTER IV

TRAINING NEEDS OF EXTENSION AGENTS

The conceptual framework for determining training needs of Extension agents shown in Figure 1 (Chapter III) was applied to the field of dairy science.

Concepts were developed in three disciplines and used to (a) determine the cognitive ability of Extension agents engaged in dairy work, and (b) obtain the reactions of agents and specialists with regard to the importance of these concepts in the agent's job.

Present ability of agents was composed of cognitive ability, as tested, and job effectiveness, as seen by dairymen and specialists.

Expected ability of agents was defined in terms of cognition. Degree of specialization required in the job was the main frame of reference. Job importance ratings of dairy science concepts by the two types of agents and by specialists provided a base of relative value. That both types of agents need to know all concepts is a logical assumption. Higher levels of cognition would depend on the specialized nature of the job and the relative work value of concepts.

Training need in specific concepts was revealed by developing a behavior-content matrix of present cognitive ability and relating it to the ability ideally expected in agents.

AGENT CHARACTERISTICS

Twenty-three agents were selected for the study--17 parish agents and six area agents. The parish agent in St. Helena Parish was designated as an area agent since he specializes in dairy work. Information was obtained from 13 parish agents and seven area agents.

Personal and Professional Characteristics

Personal and professional characteristics of the agents are shown in Table I.

Age. Parish and area agents were almost similar in age, averaging about 50 years. In both cases, there were agents in the thirties and around sixty years of age.

Education. Thirteen agents were trained in agriculture and seven in animal science at the undergraduate level. At the graduate level (chiefly Master's), 13 agents graduated in Extension Education and six in agriculture/animal science fields (Table V). Grade point averages in graduate work were about the same for parish agents (3.44) and area agents (3.42).

Extension tenure. Parish agents had served longer than area agents in different capacities. Total average Extension tenure was five years more; length of experience in dairy extension and in the supervisory position of county agent was about four years greater

TABLE I

A COMPARISON OF PARISH AND AREA DAIRY AGENTS BY PERSONAL AND PROFESSIONAL CHARACTERISTICS, LOUISIANA, 1971

Characteristics	Mean and Range				
	All Agents (N=20)	Parish Agents (N=13)		Area Agents (N=7)	
	Mean	Mean	Range	Mean	Range
Personal Characteristics					
Age (years)	49.50	50.15	33-60	48.29	37-62
Grade point (graduate)	3.43	3.44	3.10-4.00	3.42	3.10-3.90
Professional Characteristics					
Extension Tenure (years)					
Total	19.35	21.14	4-32	16.00	1-29
Dairy	8.45	9.84	0-28	5.85	0-15
Supervisory	6.40	7.92	0-32	-	-
Area dairy	2.28	-	-	2.28	1-6
Training Programs Attended (number/last 2 years)					
All	14	15	4-26	12	4-25
Dairy	5	3	0-6	9	3-18
Professional Contacts/Activities (number/last year)					
With state specialists	24	17	7-56	36	15-68
With research staff	4	4	0-9	5	0-9

(continued)

TABLE I (continued)

Characteristics	Mean and Range				
	All Agents (N=20)	Parish Agents (N=13)		Area Agents (N=7)	
	Mean	Mean	Range	Mean	Range
With associations/ organizations					
Collaborative work	3.5	3	2-6	4	3-5
Membership	2	2	1-6	2	0-4
New Information Sought					
Hours per month	7.20	4.69	1-15	11.85	2-24
Sources referred (weighted)	4.00	3.61	1-6	4.71	4-6
Magazines read (weighted)	2.65	2.30	0-5	3.28	0-5

on the average in each case.

Training programs attended. Parish agents had attended more training meetings of different kinds on an average than area agents within the last two years, but only one-third as many dairy training meetings.

Professional contacts/activities. Within the last year, area agents had twice as many contacts with the state dairy and veterinary science specialists as the parish agents and approximately the same number of contacts with research staff at the Louisiana State University and/or local experiment stations. These contacts were made for the purpose of obtaining subject matter information on problems in which the agents needed help.

Parish and area agents were equally active in membership of professional associations and organizations; the latter collaborated, on an average, with a slightly greater number of these associations in their work.

New information sought. On an average, area agents spent about 12 hours each month seeking information on developments in dairy science, as compared with nearly five hours devoted by parish agents. They also scored higher than parish agents with regard to the information sources referred (4.71 versus 3.61) and the magazines read (3.28 versus 2.30). Both these items were scored on a weighted

basis depending on the types of information sources and magazines.

Job Effectiveness

Agents were rated by concerned dairymen and specialists with regard to the effectiveness of different aspects of the job. Dairymen ratings were inferred from opinions expressed on various program components, while specialist ratings were direct expressions of agent performance. A comparison of the ratings (mean values, mean percentages and ranges) received by parish and area agents is given in Table II.

Dairymen ratings. The ratings of 53 dairymen in the parish system and 33 dairymen in the area system were averaged for each type of agent. Parish and area agents were rated almost alike on the various program components and the total program. The difference in mean ratings for the two types of agents expressed as a percentage of the maximum rating scores ranged from 0.9 to 6.5 percentage points. The ratings received by area agents were higher than those received by parish agents in three out of the five items rated, namely the total program effort (60.6 versus 58.8 percent), frequency with which help was sought from agents (62.2 versus 58.8 percent), and value of the information put out by agents (65 versus 58.5 percent). Parish agents were more favorably rated for individual problem-solving help (58.6 versus 56.6 percent) and facility of contact

TABLE II

A COMPARISON OF PARISH AND AREA DAIRY AGENTS
BY JOB EFFECTIVENESS RATINGS,
LOUISIANA, 1971

Job Item Rated	Maximum Score	Mean, Range and Percent by Type of Agent					
		Parish Agents (N=53)			Area Agents (N=33)		
		Mean			Mean		
		Value	Percent	Range	Value	Percent	Range
Dairymen ratings of agents							
Total program	25	14.70	58.8	5-17	15.16	60.6	11-17
Individual problem-solving	5	2.93	58.6	0.7-3.4	2.83	56.6	1.7-3.7
Help sought	5	2.94	58.8	1.3-4.0	3.11	62.2	2.4-3.6
Contact facility	5	2.95	58.9	0.8-4.1	2.90	58.0	2.5-3.2
Value of information	5	2.92	58.7	0.7-3.6	3.25	65.0	2.6-3.8
Specialist ratings of agents							
Total program	15	10.54	70.3	8-14	12.00	75.0	8-14
Specific abilities							
Problem identification	5	3.41	68.2	2.4-4.4	4.11	82.2	2.6-4.8
Planning	5	3.41	68.2	2.6-4.6	3.80	76.0	2.4-4.8

(continued)

TABLE II (continued)

Job Item Rated	Maximum Score	Mean, Range and Percent by Type of Agent					
		Parish Agents (N=53)			Area Agents (N=33)		
		Mean			Mean		
		Value	Percent	Range	Value	Percent	Range
Innovativeness	5	3.31	66.2	2.6-4.4	3.80	76.0	2.8-4.4
Subject matter							
Breeding	20	13.13	65.7	10.4-15.2	14.60	73.0	10.4-17.0
Nutrition	20	13.05	65.3	10.8-15.8	14.42	72.1	10.4-16.4
Management	20	11.89	59.5	9.8-14.4	13.62	63.1	10.4-15.4
Overall	60	38.09	63.5	32.0-44.0	42.65	71.8	31.2-48.6

(58.9 versus 58 percent).

Specialist ratings. Four specialists in dairy science and one specialist in veterinary science at the state level rated all agents. These ratings were averaged firstly for each agent and then for each agent type. The specialists tended consistently to rate area agents higher than parish agents. The total dairy program of area agents was rated five percentage points higher than the program of parish agents. With regard to specific abilities of agents, the widest difference in rating (14 percentage points) favoring area agents was the ability to identify problems. Planning ability, innovativeness, and knowledge and comprehension of dairy science subject matter were rated about eight to ten percentage points higher in favor of area agents.

The range of ratings on the different job abilities for both parish and area agents were about the same. Specialists rated parish agents lowest on knowledge and comprehension of management subject matter (59.5 percent) and highest on the total program (70.3 percent). Area agents were also considered low on management subject matter (68.1 percent) but were rated highest on problem identification ability (82.2 percent).

AGENT COGNITIVE ABILITY

Agent cognitive ability in dairy science was analyzed in terms of overall ability, competence in the three disciplines and level of cognition within these disciplines (Figure 2, Chapter III). Parish and area agents were compared on these dimensions. Information from specialists and dairymen supported the analysis.

A Basic Comparison

The cognitive ability of parish and area agents is compared in Table III. Maximum discipline and overall scores are shown and the means and ranges of test scores indicated. Means are presented as raw scores and as standardized scores on a percentage basis. The mean scores made by agents on three levels of cognitive ability within the disciplines are also shown. F values for the different comparisons are included.

Considering the performance of all agents by discipline, the best scores were made in management (about 65 percent), followed by nutrition (57 percent) and breeding (52 percent). When agent type was considered, the performance of parish and area agents on the three disciplines followed the same rank of scores.

Area agents scored slightly higher than parish agents in all three disciplines and consequently had a higher overall score. The difference was greatest in nutrition (8.3 percent) and smallest in

TABLE III

A COMPARISON OF THE COGNITIVE ABILITY OF DAIRY AGENTS IN DAIRY SCIENCE BY DISCIPLINE ACCORDING TO TYPE OF AGENT, LOUISIANA, 1971

Discipline	Max. Score	Mean and Range: Parish Agents (N=13) Mean Value	Parish Agents (N=13) Mean Percent	Parish Agents (N=13) Range	Area Agents (N=7) Mean Value	Area Agents (N=7) Mean Percent	Area Agents (N=7) Range	F Value
Breeding	58	29.46	50.8	14-44	31.57	54.4	12-39	<1
Knowledge	2	1.43	71.5		1.44	72.0		<1
Comprehension-Appn.	4	1.81	45.3		1.91	47.8		<1
Analysis-Synthesis-Ev.	6	3.00	50.0		2.78	46.3		<1
Nutrition	56	30.54	54.5	9-45	35.14	62.8	23-44	1.05
Knowledge	2	1.48	74.0		1.44	72.0		<1
Comprehension-Appn.	4	1.92	48.0		1.86	46.5		<1
Analysis-Synthesis-Ev.	6	3.10	51.7		4.04	67.3		2.05(d)
Management	56	36.30	64.8	21-52	37.14	66.3	17-46	<1
Knowledge	2	0.83	41.5		1.14	57.0		<1
Comprehension-Appn.	4	2.55	63.8		2.93	73.3		<1
Analysis-Synthesis-Ev.	6	4.54	75.7		4.57	76.2		<1

(continued)

TABLE III (continued)

Discipline	Max. Score	Mean and Range: Parish Agents (N=13) Mean Value	Parish Agents (N=13) Mean Percent	Parish Agents (N=13) Range	Area Agents (N=7) Mean Value	Area Agents (N=7) Mean Percent	Area Agents (N=7) Range	F Value
Overall	170	96.30	56.6	59-124	103.85	61.1	65-123	<1
Knowledge	2	1.19	55.9		1.34	67.0		<1
Comprehension-Appn.	4	2.09	52.3		2.23	55.8		<1
Analysis-Synthesis-Ev.	6	3.55	59.3		3.80	63.3		<1

(d) $P < .20$.

management (1.5 percent). The margin on overall score in dairy science was 4.5 percent. The range of discipline and overall scores of area agents was consistently narrower than parish agent scores. However, as seen from the low F values, the differences in mean discipline and overall scores between the two agent types were too small to be statistically significant.

When cognitive ability at three behavior levels, namely, knowledge, comprehension-application, and analysis-synthesis-evaluation, was considered, differences between the two agent types became more apparent. A statistically significant difference in ability favoring area agents was observed only at evaluative level in nutrition ($P < .02$). However, there were observable differences between the two types of agents on other levels of ability in the several disciplines and overall subject matter. Considering knowledge, area agents had higher mean standardized scores in management (15.5 percent) and overall subject matter (11.1 percent) with practically no difference in breeding and nutrition. They also showed higher ability to apply management concepts (9.5 percent) than parish agents. There was hardly any difference (less than 5 percent) in breeding, nutrition and overall subject matter. As already indicated, area agents had a significantly higher mean score than parish agents at the evaluative level in nutrition (67.3 versus 51.7 percent). At this cognitive level, area agents tended to be slightly higher in overall subject matter (63.3

versus 59.3 percent) than parish agents, while the latter had some edge in breeding. In management, at this level of cognitive ability, the two agent types had practically similar ability.

It would appear that area agents tended to have a slight advantage in cognitive ability in dairy science subject matter, in the disciplines of breeding, nutrition and management, and over a number of discipline-cognitive behavior level combinations. Although this superiority was found to be statistically significant only in one discipline-cognitive behavior level combination, it could logically be inferred that greater specialization needed by the area agents was partly responsible for the differences in their favor. However, a number of other factors may be involved as will be seen in the discussion on overall cognitive ability that follows.

Overall Cognitive Ability

The mean overall cognitive ability in dairy science of parish and area agents was related to their characteristics by simple linear correlation analysis. For some of the characteristics factorial analysis was used.

Relationship with personal characteristics. The correlations between mean overall cognitive ability and personal characteristics of agents are shown in Table IV.

With respect to age, it was observed that in the case of both

TABLE IV

RELATIONSHIP BETWEEN MEAN OVERALL COGNITIVE ABILITY IN DAIRY SCIENCE AND PERSONAL CHARACTERISTICS OF DAIRY AGENTS ACCORDING TO TYPE OF AGENT, LOUISIANA, 1971

Personal Characteristics	Correlation with Mean Overall Cognitive Ability		
	All Agents (N=20)	Parish Agents (N=13)	Area Agents (N=7)
	(Correlation Coefficients)		
Age	-.54(a)	-.36(e)	-.87(a)
Grade point (graduate work)*	.52(b)	.54(c)	.64(e)

(a) $P < .01$, (b) $P < .05$, (c) $P < .10$, (e) $P < 0.25$.
*Grade point average for 12 parish agents and 5 area agents.

types of agents there was a significant association between higher ability and lower age. This relationship was highly significant for area agents (.01 level) and much less significant for parish agents (.25 level).

As might be expected, there was a positive correlation between grade point average in graduate work and mean overall cognitive ability of both types of agents. These correlations were statistically significant at a higher level for parish agents (.10 level), as compared with area agents (.25 level).

Considering education with respect to field of specialization (Table V) greater differences in mean overall cognitive ability of agents were observed at undergraduate level than at graduate level. Undergraduate majors in animal science had slightly higher mean scores (104.67) than agriculture majors (96.50). Extension Education graduates also scored somewhat higher (101.80) than those graduating in technical fields of agriculture/animal science (98.30). These differences showed at both academic levels when the agents were categorized by type. The area agents performed better than the parish agents across the fields of specialization. The differences were more marked in both fields at graduate level and in agriculture undergraduate majors.

Observed differences in agent performance at undergraduate and graduate levels were found to be non-significant both with regard to field of specialization and type of agent.

TABLE V

A COMPARISON OF MEAN OVERALL COGNITIVE ABILITY OF DAIRY AGENTS IN DAIRY SCIENCE BY FIELD OF SPECIALIZATION AT THE UNDERGRADUATE AND GRADUATE LEVELS ACCORDING TO TYPE OF AGENT, LOUISIANA, 1971

Field of Specialization	Mean Overall Cognitive Ability						F Value	
	All Agents		Parish Agents		Area Agents			
	No.	Mean	No.	Mean	No.	Mean	Field	Type of Agent
Undergraduate								
Agriculture	14	96.50	10	94.20	4	102.20	<1	<1
Animal Science	6	104.67	3	103.30	3	106.00		
Graduate								
Technical field*	6	98.30	5	95.80	1	111.00	0.00	1.15
Extension Education	13	101.80	8	96.62	5	110.00		

(*Agriculture and Animal Science)

Relationship with professional characteristics. Tenure, participation in training programs, professional contacts, and active information seeking were expected to be positively correlated with overall cognitive ability, regardless of the type of agent. This was not borne out, however, by the correlations between ability and professional characteristics of the agents (Table VI). Furthermore, the direction of correlation was opposite for parish and area agents for almost all the characteristics.

Considering Extension tenure, high scores of mean overall cognitive ability were made by parish agents who had longer total tenure ($r = .23$) and had worked for more time in dairy work ($r = .34$) and in the supervisory position of county agent ($r = .41$). In contrast, a negative correlation was observed between mean overall cognitive ability of area agents and total tenure ($r = -.57$) and experience in dairy work ($r = -.52$), indicating that shorter tenure in these different capacities was related to better test performance.

The positive correlation between mean overall cognitive ability of parish agents and supervisory tenure was statistically significant at the .20 level. Negative correlations in the case of area agents were also found to be statistically significant--.20 level for total tenure and .25 for length of experience in dairy work.

With regard to extent of participation in training programs, it was found that mean overall cognitive ability of parish agents was negatively related with the number of all types of training programs

TABLE VI

RELATIONSHIP BETWEEN MEAN OVERALL COGNITIVE ABILITY IN DAIRY SCIENCE AND PROFESSIONAL CHARACTERISTICS OF DAIRY AGENTS ACCORDING TO TYPE OF AGENT, LOUISIANA, 1971

Professional Characteristics	Correlation with Mean Overall Cognitive Ability		
	All Agents (N=20)	Parish Agents (N=13)	Area Agents (N=7)
	(Correlation Coefficients)		
Extension Tenure			
Total	-.11	.23	-.57(d)
Dairy	.11	.34	-.52(e)
Supervisory	.07	.41(d)	
Training Programs Attended			
Total	-.49(b)	-.74(a)	.14
Dairy	-.04	-.52(c)	.02
Technical Contacts/ Activities			
With state specialists	-.08	-.25	-.15
With research staff	-.20	-.18	-.40
With associations/ organizations			
Collaborative work	-.14	-.20	.33
Membership	-.001	.15	-.22
New Information Sought			
Time spent	.13	-.39(d)	.47
Sources referred	.06	.12	-.42
Magazines read	.001	.11	-.38

(a) P < .01, (b) P < .05, (c) P < .10, (d) P < .20, (e) P < .25.

(r = -.74), as well as with the number of dairy training programs (r = -.52) attended by them. This correlation was statistically significant at the .01 level for all training and at the .10 level for dairy training programs. In the case of area agents, there was a low positive correlation which was not statistically significant.

In the case of both area and parish agents, there was a low negative correlation between mean overall cognitive ability and professional contacts with specialists and research staff. This meant that those individuals who scored higher on mean overall cognitive ability had less need for specialist-researcher assistance. It would appear logical that the more knowledgeable individuals would be more self-reliant in problem situations. The probability that the relationship between ability and contact frequency could also be affected by situational factors such as time, opportunity, etc. cannot, however, be eliminated.

Parish agents who scored higher on overall cognitive ability, tended, on the average, to have membership with a larger number of professional associations and organizations (r = .15) but, at the same time, did not collaborate in their work with as many of these organizations (r = -.20) as did those parish agents who secured lower scores of overall cognitive ability. The correlations of mean overall cognitive ability with these two aspects of professional activity were reversed in the case of the area agents, in contrast to what was observed with parish agents.

Information sought by agents on developments in dairy science was related to cognitive ability, assuming that active information seeking would be associated with higher test scores. The correlation coefficients shown in Table VI for the two types of agents did not support this view; nor was there a similarity of relationship between the two groups. While parish agents who scored higher appeared to spend significantly less time ($r = -.39$, $P < .20$) seeking out information than those who had lower mean scores, area agents tended to take the opposite position, high scoring agents spending more time on this activity ($r = .47$). Considering the scores received on number of information sources referred and magazines read, the mean overall cognitive ability of parish agents showed a low positive correlation, while that of area agents was negatively associated with these information seeking activities.

The extent to which agents sought new information as related to mean overall cognitive ability is compared by agent type in Table VII. Area agents who sought information often had a lower mean overall cognitive ability than parish agents in the same category. Comparison between the two types of agents on cognitive ability with respect to the other two categories of information seeking, namely, sometimes and occasionally, would not be appropriate since only one area agent figured in each category. The mean overall cognitive ability of area and parish agents was not significantly different, either with respect to extent of information seeking or the type of agent.

TABLE VII

A COMPARISON OF MEAN OVERALL COGNITIVE ABILITY OF DAIRY AGENTS IN DAIRY SCIENCE BY EXTENT INFORMATION SOUGHT ACCORDING TO TYPE OF AGENT, LOUISIANA, 1971

Extent Information Sought	Mean Overall Cognitive Ability				F Value	
	Parish Agents		Area Agents			
	No.	Mean	No.	Mean	Extent	Type
Often	5	102.20	5	99.20		
Sometimes	6	87.33	1	123.00	< 1	< 1
Occasionally	2	108.50	1	108.00		

Relationship with job effectiveness. Mean overall cognitive ability scores of parish and area agents were tested for significant association with the ratings of dairymen and specialists to see the extent to which such ratings of job ability accurately reflected subject matter competencies. The correlation coefficients of mean overall cognitive ability and the several job ratings are presented in Table VIII.

When all agents were considered, dairymen ratings of the various job abilities of agents appeared to be fairly accurate estimates of cognitive ability. The correlations between mean overall cognitive ability and dairymen ratings of agents with regard to the total program ($r = .39$) individual problem-solving help received ($r = .34$) and value of information turned out ($r = .33$) were positive and significant at the .20 level. Higher significance (.05 level) was observed for the correlation between cognitive ability and the help sought by dairymen from agents ($r = .54$), this being an indicator of confidence in the agent. The facility of contact with agents was not related to cognitive ability; apparently, this is a situational feature of agent-dairymen relationship and cannot be related to agent ability.

Considering dairymen ratings of agents by type, the correlation between mean overall cognitive ability and help sought by dairymen was significant for both parish agents ($r = .48$, $P < .20$) and area agents ($r = .87$, $P < .05$). While the remaining correlations for parish agents were positive, these were too low to be significant. In the

TABLE VIII

RELATIONSHIP BETWEEN MEAN OVERALL COGNITIVE ABILITY IN DAIRY SCIENCE AND JOB EFFECTIVENESS RATINGS OF DAIRY AGENTS BY TYPE OF AGENT, LOUISIANA, 1971

Job Item Rated	Correlation with Mean Overall Cognitive Ability		
	All Agents (N=20)	Parish Agents (N=13)	Area Agents (N=7)
	(Correlation Coefficients)		
Dairymen ratings of agents*			
Total program	.39(d)	.27	.81(b)
Individual problem-solving	.34(d)	.20	.63(d)
Help sought	.54(b)	.48(d)	.87(b)
Contact facility	.19	.09	.91(a)
Value of information	.33(d)	.36	.36
Specialist ratings of agents			
Total program	.32(d)	.52(c)	-.17
Specific abilities			
Problem identification	.40(d)	.66(a)	-.24
Planning	.20	.48(c)	-.38
Innovativeness	.49(b)	.67(a)	-.02
Subject matter			
Breeding	.26	.51(a)	-.27
Nutrition	.37(c)	.49(c)	.06
Management	.31(d)	.57(b)	-.31
Overall	.33(d)	.55(b)	-.18

(a) $P < .01$, (b) $P < .05$, (c) $P < .10$, (d) $P < .20$, (e) $P < .25$.
*Dairymen ratings for 10 parish agents and 6 area agents.

case of area agents, significant association was observed between cognitive ability and ratings of the total program ($r = .81$, $P < .01$), problem-solving assistance ($r = .63$, $P < .20$), help sought ($r = .87$, $P < .05$) and facility of contact with agents ($r = .91$, $P < .01$).

Specialist ratings of the total program of agents and specific abilities were correlated with mean overall cognitive ability of all agents and agents by type. Significant positive correlations were found in the case of parish agents for all job item ratings. With area agents all but one of the correlations were negative. When all agents were considered, the correlations were once again positive, but the significance levels were either lowered or eliminated as a result of the negative relationships for the area agents.

Highly significant correlations (.01 level) were observed between mean overall cognitive ability of parish agents and specialist ratings of their abilities in identifying dairy problems ($r = .66$) and in accepting and implementing new ideas ($r = .67$), and their knowledge and comprehension of breeding subject matter ($r = .51$). Slightly lower significance was found with respect to management subject matter ($r = .57$, $P < .05$) nutrition subject matter ($r = .49$, $P < .10$) and planning ability ($r = .48$, $P < .10$).

An implication of the significantly close association of specialist ratings and mean overall cognitive ability of parish agents

would logically be the use of such ratings for agent evaluation. However, when specialist ratings of area agents were considered, the tendency consistently was for specialists to rate agents having higher cognitive ability lower on the various job abilities and vice versa. This was observed from the negative correlations between mean overall cognitive ability of area agents and specialist ratings of all job items, except knowledge and comprehension of nutrition subject matter which also was so low on positive correlation as to be unrelated. In view of the contradictory correlations for the two types of agents, agent ratings by specialists do not appear to be completely reliable indices of agent cognitive ability.

Comparing dairymen and specialist ratings in terms of consistency of correlation with agent cognitive ability, it would seem that dairymen tended to provide a more reliable estimate than specialists, regardless of agent type.

Discipline Cognitive Ability

It was expected that agent test scores of cognitive ability in the several disciplines would be positively related to the ratings by agents of the job importance of respective discipline concepts and the ratings by specialists of the ability of agents in these disciplines. This would mean that agents who had higher scores on discipline cognitive ability would tend to rate more importantly a larger number of concepts and, secondly, would be rated more highly by specialists on

subject matter ability. The results of correlation analysis of these relationships are shown in Table IX.

Parish agents who received higher scores on discipline cognitive ability tended to be more consistent in job importance ratings of discipline concepts than area agents. The higher scoring parish agents rated a larger number of breeding ($r = .43$, $P < .20$) and nutrition concepts ($r = .08$) more importantly than did those parish agents who had scored lower on discipline cognitive ability. With regard to management concepts, there was a very slight negative correlation ($r = -.07$) indicating that discipline cognitive ability of parish agents and their job importance ratings of management concepts were unrelated. With regard to area agents, the correlation between discipline cognitive ability and job importance ratings of related concepts was low positive for breeding ($r = .11$) and low negative for nutrition ($r = -.19$) and management ($r = -.13$). This would indicate that area agents having low or high scores of discipline cognitive ability were inconsistent in their importance ratings of discipline concepts.

Estimates by the specialists of the subject matter ability of parish agents in the three disciplines tended to agree with the performances of the agents. However, for the area agents there was definite disagreement in specialist estimates and agent performance in the disciplines of breeding and management, with some measure of agreement appearing in the discipline of nutrition.

TABLE IX

RELATIONSHIP OF COGNITIVE ABILITY OF DAIRY AGENTS WITH AGENT RATINGS OF JOB IMPORTANCE AND SPECIALIST RATINGS OF AGENT SUBJECT MATTER ABILITY BY DISCIPLINE ACCORDING TO TYPE OF AGENT, LOUISIANA, 1971

Discipline Cognitive Ability	Correlation with Ratings by Type of Agent			
	Job Importance		Agent Ability	
	Parish Agent (N=13)	Area Agent (N=7)	Parish Agent (N=13)	Area Agent (N=7)
	(Correlation Coefficients)			
Breeding Concepts	.43(d)	.11	.30	-.63(c)
Nutrition Concepts	.08	-.19	.34	.43
Management Concepts	-.07	-.13	.68(a)	-.53(e)

(a) $P < .01$, (c) $P < .10$, (d) $P < .20$, (e) $P < .25$.

The parish agents who scored high on discipline cognitive ability (management) were also rated significantly higher than the others by the specialists ($r = .68$, $P < .01$). Moderately positive correlations were also observed between agent scores and specialist ratings in breeding ($r = .30$) and nutrition ($r = .34$), although these were not significant. With regard to area agents, discipline cognitive ability in nutrition was associated somewhat with specialist ratings ($r = .43$), but the significant negative correlations for breeding ($r = -.63$, $P < .10$) and management ($r = -.53$, $P < .25$) indicated that specialist estimates of the ability of area agents in these subject matter fields were not reliable indices of their cognitive ability in the respective disciplines.

The results observed with regard to specialist ratings and agent performance in the three disciplines follows the pattern observed earlier with overall agent cognitive ability (Table VIII).

Cognitive Level

Tyler (11) has recommended the specification of educational objectives in the form of a two-dimensional behavior-content matrix. This recommendation was applied to the test data on agents and a behavior-content matrix of the present ability of agents was developed. This was done by categorizing the questions in the test instrument into three cognitive levels, namely, knowledge, comprehension-application, and analysis-synthesis-evaluation, relating to the several concepts that were sampled. Agent responses to these questions were scored

on a graduated scale corresponding to the three levels and the average performance scores for the several concepts recorded by type of agent. The developed matrix is presented in Table X. For each discipline concept, mean scores on the cognitive level(s) tested are indicated, along with the corresponding F values to reveal differences, if any, between the performance of parish and area agents.

The results are discussed first in terms of the three cognitive levels across the different disciplines and then within the same discipline.

Knowledge. Agents could score a maximum of two points on knowledge of a particular concept.

With regard to breeding concepts, agents appeared to have best knowledge of mating systems (2.0) and least knowledge about selection (1.15). Knowledge about breeding efficiency/artificial insemination (1.50) and hormones (1.50) was fairly high. Overall knowledge of breeding concepts was also good. Parish and area agents did not differ significantly on knowledge of these concepts, except in the case of hormones ($F = 1.82$, $P < .25$), where parish agents (1.69) had a higher knowledge score than area agents (1.43).

Knowledge of nutrition concepts was also fairly high. Parish and area agents were fairly close on knowledge of feed evaluation/ standards (1.58 and 1.74), balancing rations (1.38 and 1.43), ruminant digestion (1.69 and 1.43) and overall nutrition (1.48 and

TABLE X

BEHAVIOR-CONTENT MATRIX OF PRESENT ABILITY OF DAIRY AGENTS ON SELECTED DAIRY SCIENCE CONCEPTS BY THREE LEVELS OF COGNITIVE ABILITY ACCORDING TO TYPE OF AGENT, LOUISIANA, 1971

	Mean Cognitive Ability Score by Cognitive Level and Type of Agent and F Values											
	Knowledge*				Comprehension-Application*				Analysis-Synthesis-Evaluation*			
	Mean				Mean				Mean			
	All Agents	Parish Agents	Area Agents	F Value	All Agents	Parish Agents	Area Agents	F Value	All Agents	Parish Agents	Area Agents	F Value
	1.15	1.17	1.11	<1	.75	.70	.85	<1	-	-	-	-
	2.00	2.00	2.00	0	2.20	2.31	2.00	<1	3.15	3.00	3.43	<1
	-	-	-	-	-	-	-	-	2.70	3.00	2.14	1.94(e)
I.	1.50	1.38	1.71	<1	2.60	2.46	2.86	<1	-	-	-	-
	1.50	1.69	1.43	1.82(e)	2.70	2.76	2.57	<1	-	-	-	-
	1.43	1.43	1.44	<1	1.84	1.80	1.91	<1	2.93	3.00	2.78	<1
rds	1.63	1.58	1.74	<1	-	-	-	-	2.58	2.31	3.07	1.87(e)
	-	-	-	-	1.90	1.92	1.86	<1	-	-	-	-
	1.30	1.38	1.43	<1	-	-	-	-	4.25	3.85	5.00	<1
	1.60	1.69	1.43	<1	-	-	-	-	-	-	-	-
	1.30	1.08	1.71	2.03(d)	-	-	-	-	-	-	-	-
	1.47	1.48	1.44	<1	1.90	1.92	1.86	<1	3.43	3.10	4.04	2.05(d)

(continued)

TABLE X

BEHAVIOR-CONTENT MATRIX OF PRESENT ABILITY OF DAIRY AGENTS ON SELECTED DAIRY SCIENCE CONCEPTS BY THREE LEVELS OF COGNITIVE ABILITY ACCORDING TO TYPE OF AGENT, LOUISIANA, 1971

Concepts Sampled	Mean Cognitive Ability Score by Cognitive Level and Type of Agent and F									
	Knowledge*				Comprehension-Application*				Analysis-E	
	Mean				Mean				Mean	
	All Agents	Parish Agents	Area Agents	F Value	All Agents	Parish Agents	Area Agents	F Value	All Agents	Parish Agents
Breeding										
Selection	1.15	1.17	1.11	<1	.75	.70	.85	<1	-	-
Mating systems	2.00	2.00	2.00	0	2.20	2.31	2.00	<1	3.15	3.00
Heritability	-	-	-	-	-	-	-	-	2.70	3.00
Breeding efficiency/A.I.	1.50	1.38	1.71	<1	2.60	2.46	2.86	<1	-	-
Hormones	1.50	1.69	1.43	1.82(e)	2.70	2.76	2.57	<1	-	-
Overall (Breeding)	1.43	1.43	1.44	<1	1.84	1.80	1.91	<1	2.93	3.00
Nutrition										
Feed evaluation/standards	1.63	1.58	1.74	<1	-	-	-	-	2.58	2.31
Feeding management	-	-	-	-	1.90	1.92	1.86	<1	-	-
Balancing rations	1.30	1.38	1.43	<1	-	-	-	-	4.25	3.85
Ruminant digestion	1.60	1.69	1.43	<1	-	-	-	-	-	-
Metabolism	1.30	1.08	1.71	2.03(d)	-	-	-	-	-	-
Overall (Nutrition)	1.47	1.48	1.44	<1	1.90	1.92	1.86	<1	3.43	3.10

(continued)

TABLE X (continued)

Mean Cognitive Ability Score by Cognitive Level and Type of Agent and F Values

Knowledge*				Comprehension-Application*				Analysis-Synthesis-Evaluation*			
Mean				Mean				Mean			
All Agents	Parish Agents	Area Agents	F Value	All Agents	Parish Agents	Area Agents	F Value	All Agents	Parish Agents	Area Agents	F Value
-	-	-	-	2.46	2.25	2.86	<1	-	-	-	-
-	-	-	-	3.34	3.18	3.63	1.12	-	-	-	-
1.00	.92	1.43	<1	1.40	1.54	1.14	<1	4.80	4.15	6.00	2.79(d)
-	-	-	-	-	-	-	-	4.80	5.08	4.23	<1
.80	.61	1.14	1.27	-	-	-	-	-	-	-	-
.95	.84	1.14	<1	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	4.05	4.39	3.43	1.36
.94	.83	1.14	<1	2.69	2.55	2.93	<1	4.55	4.54	4.57	<1

es: Knowledge - 2; Comprehension-Application - 4; Analysis-Synthesis-Evaluation - 6.

TABLE X (continued)

Concepts Sampled	Mean Cognitive Ability Score by Cognitive Level and Type of Agent and F V									
	Knowledge*				Comprehension-Application*				Analys E	
	Mean				Mean				Mea	
	All Agents	Parish Agents	Area Agents	F Value	All Agents	Parish Agents	Area Agents	F Value	All Agents	Pari Ager
Management										
Production records	-	-	-	-	2.46	2.25	2.86	<1	-	-
Herd management (feeding)	-	-	-	-	3.34	3.18	3.63	1.12	-	-
Herd health	1.00	.92	1.43	<1	1.40	1.54	1.14	<1	4.80	4.15
Heifer management	-	-	-	-	-	-	-	-	4.80	5.08
Stress	.80	.61	1.14	1.27	-	-	-	-	-	-
Adaptation to stress	.95	.84	1.14	<1	-	-	-	-	-	-
Building facilities	-	-	-	-	-	-	-	-	4.05	4.39
Overall (Management)	.94	.83	1.14	<1	2.69	2.55	2.93	<1	4.55	4.54

*Maximum average scores: Knowledge - 2; Comprehension-Application - 4; Analysis-Synthesis-Evaluation - 6.

1.44) so that the F values were too small to be significant. The only significant difference in knowledge was observed with regard to the concept of metabolism, area agents having a higher mean score (1.71) than parish agents (1.68). This difference was statistically significant at the .20 level.

In the discipline of management, the agents registered relatively lower scores (about one-third) compared with the two other disciplines. Area agents showed consistently higher knowledge than parish agents on concepts of herd health, stress, adaptability and overall management, although the differences were not statistically significant.

Comprehension-application. This was the middle level of cognitive ability and was allocated a maximum score of four on each concept tested.

While knowledge of overall management concepts (0.94) had been found to be lower among agents than knowledge of overall breeding (1.43) and nutrition concepts (1.47) the reverse was observed at the comprehension-application level. Agents tended to be superior at this level of cognitive ability in management (2.69), as compared with breeding (1.84) and nutrition (1.90).

With regard to breeding, the highest comprehension and application in agent ability was found in the concepts of breeding efficiency/artificial insemination (2.60), hormones (2.70), and mating systems (2.20) and the lowest in selection (0.75). Parish

agents were slightly superior in two concepts and area agents in the remaining two concepts. The superiority in either case was too small to be statistically significant.

Only one nutrition concept, namely feeding management, was sampled at this level of ability. Overall agent performance (1.90) was below 50 percent of the maximum score and neither type of agent showed to advantage.

In the field of management, agents performed well above 75 percent of maximum attainable in herd management-feeding (3.34) and less than one-half as well on herd health (1.40). Production records (2.46) appeared to be fairly well comprehended. Area agents did better than parish agents on production records (2.86 and 2.25) and herd management-feeding (3.63 and 3.18) and poorer on herd health (1.14 and 1.54). However, none of these differences was statistically significant, so that it could be concluded that the two agent types had approximately the same ability to comprehend and apply management concepts.

Analysis-synthesis-evaluation. At this highest level of cognitive ability, agent responses were scored against a maximum of six possible points.

On an overall discipline basis, agents recorded highest mean scores of this level of cognitive ability on management concepts (4.55), followed by nutrition concepts (3.43) and breeding concepts (2.93).

Parish agents tended to be consistent on both the breeding concepts sampled, namely, mating systems and heritability, registering the same score (3.0) on each. Area agents were slightly higher on mating systems (3.43) and somewhat lower on heritability (2.14), the latter difference between agents' scores being significant at the .25 level. On overall breeding, however, there was no difference between the two agent types.

Two nutrition concepts were sampled, namely, feed evaluation/standards and balancing rations. Area agents were superior in both cases--3.07 versus 2.31 points on the former concept ($P < .25$) and 5.00 versus 3.85 points on the latter (not significant). Consequently, on overall nutrition, the difference between parish and area agents in evaluative ability was significant at the .20 level of significance.

With regard to management concepts, while these overall scores of parish and area agents in evaluative ability were almost similar (4.5), there was a significant difference favoring area agents on herd health (6.0 versus 4.15, $P < .20$). However, parish agents had an advantage on the remaining two concepts, namely, heifer management (5.08 versus 4.23) and building facilities (4.39 versus 3.43).

Cognitive levels within discipline. Having looked at the three cognitive levels separately, it would be appropriate to see the trend of agent performance across cognitive levels in the three disciplines. For comparative purposes, raw means for the different cognitive

levels were converted into standard percentage scores. The standardized means are presented in Table XI in the same way as the raw means in Table X except for the F values, which have been excluded.

In general, owing to the practical nature of their job, Extension professionals are expected to possess fairly high problem-solving ability. This would be synonymous with the ability to analyze, synthesize and evaluate information. As this is stipulated to be the highest level of cognitive ability individuals would normally have to know, and also be able to comprehend and apply, subject matter concepts before they can successfully solve problems. Consequently, a linear positive relationship should be expected among the three levels, when the evaluative ability is high. On the other hand, situations could reasonably be anticipated where knowledge is high and the two upper levels of cognitive ability are much lower, or where knowledge and comprehension-application are high and evaluative ability is lower.

Considering agent performance on overall breeding in the light of the above observation, it was observed that, regardless of agent type, the trend was high knowledge (71 percent) and lower than average comprehension-application and analysis-synthesis-evaluation (45-50 percent). In nutrition as well, agents had high knowledge (72 percent) and considerably lower comprehension-application ability (46.5 percent). Evaluative ability picked up

TABLE XI

A COMPARISON OF THE MEAN PERCENTAGE SCORES OF DAIRY AGENTS ON SELECTED DAIRY SCIENCE CONCEPTS BY THREE LEVELS OF COGNITIVE ABILITY ACCORDING TO TYPE OF AGENT, LOUISIANA, 1971

Concepts Sampled	Mean Percentage Scores by Cognitive Level and Type of Agent					
	Knowledge		Comprehension-Application		Analysis-Synthesis-Evaluation	
	Parish Agents	Area Agents	Parish Agents	Area Agents	Parish Agents	Area Agents
Breeding						
Selection	58.5	55.5	17.5	21.3	-	-
Mating systems	100.0	100.0	57.8	50.0	50.0	57.2
Heritability	-	-	-	-	50.0	35.3
Breeding efficiency/A.I.	64.0	85.5	61.5	71.5	-	-
Hormones	84.5	71.5	69.0	64.3	-	-
Overall (Breeding)	71.5	72.0	45.3	47.8	50.0	46.3
Nutrition						
Feed evaluation/standards	79.0	87.0	-	-	38.5	51.2
Feeding management	-	-	48.0	48.5	-	-
Balancing rations	69.0	71.5	-	-	64.2	83.3
Ruminant digestion	84.5	71.5	-	-	-	-
Metabolism	54.0	85.5	-	-	-	-
Overall (Nutrition)	74.0	72.0	48.0	46.5	51.7	67.3

(continued)

TABLE XI (continued)

Concepts Sampled	Mean Percentage Scores by Cognitive Level and Type of Agent					
	Knowledge		Comprehension-Application		Analysis-Synthesis-Evaluation	
	Parish Agents	Area Agents	Parish Agents	Area Agents	Parish Agents	Area Agents
Management						
Production records	-	-	56.3	71.5	-	-
Herd management-feeding	-	-	79.5	90.8	-	-
Herd health	46.0	71.5	38.5	28.5	67.5	100.0
Heifer management	-	-	-	-	84.7	70.5
Stress	30.5	57.0	-	-	-	-
Adaptation to stress	42.0	57.0	-	-	-	-
Building facilities	-	-	-	-	73.2	57.2
Overall (Management)	41.5	57.0	63.8	73.3	75.7	76.2

considerably in area agents (65.7 percent) and remained at about the average level in parish agents (51.7 percent). With regard to management subject matter, a different situation was observed in that parish and area agents moved from low knowledge (41 and 57 percent) to high performance on comprehension-application (63.8 and 73.3 percent) and analysis-synthesis-evaluation (75.3 and 76.2 percent). While this could be the result of not testing all cognitive levels of the several concepts included in the discipline, a similar trend was observed in the concept of herd health which was carried through all three levels. However, this unique observation is not adequate or reliable to suggest any modifications in the accepted theoretical position on the hierarchy of cognitive ability levels.

Expected Ability and Present Ability

The concept that training need can be equated with the discrepancy between expected ability and present ability enunciated by Tyler was examined in relation to cognition. As indicated earlier, cognitive ability expected of agents is related to the degree of job specialization. Client demand for more specialized help from agents implies the need for the highest level cognitive ability in all discipline concepts. Present ability, as determined by the test procedure, was matched with expected ability in terms of the overall disciplines. Invariably, at all levels in the three disciplines, as well as for the several discipline concepts, there was discrepancy between expected and

present ability, indicating the need for training.

JOB IMPORTANCE OF DAIRY SCIENCE CONCEPTS

The importance of scientific concepts in a discipline field is influenced by two basic criteria, namely, the job and the professional who is making judgments. The job requirement of concepts varies basically with the degree of specialization needed to fill job roles. Professionals in the academic field would normally be inclined to rate a larger number of discipline concepts more highly than those in practical work situations. Research and teaching faculty may, therefore, have views about job importance of the several concepts which differ from the views of Extension professionals. The latter also may, within themselves, not entirely agree in their opinions. The dimension of rank importance of dairy science concepts in the job of the Extension agent was, therefore, studied to gain further insight into training need and curriculum development in the field of subject matter.

Comments were limited to Extension professionals--parish agents, area agents and state specialists in dairy and veterinary science. Twenty-five major concepts were rated--six in breeding, eight in nutrition and 11 in management. Sub-concepts for the major concepts ranged from none to a maximum of seven. The range of rating score for each sub-concept was one through five. Scores for the sub-concepts were averaged to give mean values for the major

concepts. These means were summed for each discipline to give a maximum discipline rating of 30 for breeding, 40 for nutrition and 55 for management. The mean importance ratings given by the agents and specialists to the several concepts are indicated in Table XII as raw values and as standard percentage ratings. One-way analysis of variance was used to test for significant difference among the ratings of the three types of professionals. The F values obtained with two and 22 degrees of freedom are shown against each concept.

Discipline Ratings

Considering the overall discipline ratings, there was fairly close agreement among agents and specialists with regard to the importance of concepts in all three disciplines, except for breeding which specialists rated somewhat, but not significantly, lower than agents. The highest rank was accorded to management concepts (76.7 percent) by all professionals, followed by nutrition (72.8 percent), with breeding (70.0 percent) ranked lowest.

Breeding Concepts

Breeding efficiency was ranked highest by both agents and specialists (76-84 percent). Selection was ranked lowest by the agents (62 percent) and artificial insemination by the specialists (47.2 percent). Parish and area agents rated all six breeding concepts within five percentage points of one another. Specialists, on the

TABLE XII

A COMPARISON OF THE MEAN IMPORTANCE RATINGS OF DAIRY SCIENCE CONCEPTS IN THE WORK OF DAIRY AGENTS ACCORDING TO TYPE OF EXTENSION PROFESSIONAL, LOUISIANA, 1971

	Max. Rating	Mean Ratings (Values and Percentages)								F Value
		Agents and Specialists (N=25)		Parish Agents (N=13)		Area Agents (N=7)		Specialists (N=5)		
		Value	Percent	Value	Percent	Value	Percent	Value	Percent	
	5	3.14	62.8	3.16	63.2	3.08	61.6	3.16	63.2	<1
	5	3.10	62.0	3.23	64.6	3.07	61.4	2.80	56.0	<1
	5	3.80	76.0	3.85	77.0	3.71	74.2	3.80	76.0	<1
	5	3.88	77.6	3.77	75.4	3.86	77.2	4.20	84.0	<1
on	5	3.56	71.2	3.88	77.6	3.84	76.8	2.36	47.2	7.50(b)
	5	3.50	70.0	3.51	70.2	3.81	76.2	3.06	61.2	<1
	30	21.00	70.0	21.40	71.3	21.38	71.3	19.38	64.6	1.23
ems	5	3.96	79.2	3.97	79.4	4.01	80.2	3.84	76.8	<1
	5	4.04	80.8	4.02	80.4	4.18	83.6	3.90	78.0	<1
	5	4.10	82.0	4.06	81.2	4.41	88.2	3.74	74.8	1.61
t	5	3.63	72.6	3.42	68.4	3.84	76.8	3.86	77.2	2.30(d)
	5	2.94	58.8	2.69	53.8	2.93	58.6	3.60	72.0	1.50

(continued)

TABLE XII

A COMPARISON OF THE MEAN IMPORTANCE RATINGS OF DAIRY SCIENCE CONCEPTS IN THE WORK OF DAIRY AGENTS ACCORDING TO TYPE OF EXTENSION PROFESSIONAL, LOUISIANA, 1971

Concept	Max. Rating	Mean Ratings (Values and Percentages)						
		Agents and Specialists (N=25)		Parish Agents (N=13)		Area Agents (N=7)		Spe
		Value	Percent	Value	Percent	Value	Percent	Valu
Breeding Concepts								
Selection	5	3.14	62.8	3.16	63.2	3.08	61.6	3.1
Mating systems	5	3.10	62.0	3.23	64.6	3.07	61.4	2.8
Heritability	5	3.80	76.0	3.85	77.0	3.71	74.2	3.8
Breeding efficiency	5	3.88	77.6	3.77	75.4	3.86	77.2	4.2
Artificial Insemination	5	3.56	71.2	3.88	77.6	3.84	76.8	2.3
Hormones	5	3.50	70.0	3.51	70.2	3.81	76.2	3.0
Overall (Breeding)	30	21.00	70.0	21.40	71.3	21.38	71.3	19.3
Nutrition Concepts								
Feed evaluation systems	5	3.96	79.2	3.97	79.4	4.01	80.2	3.8
Feeding standards	5	4.04	80.8	4.02	80.4	4.18	83.6	3.9
Balancing rations	5	4.10	82.0	4.06	81.2	4.41	88.2	3.7
Feeding management	5	3.63	72.6	3.42	68.4	3.84	76.8	3.8
Ruminant digestion	5	2.94	58.8	2.69	53.8	2.93	58.6	3.6

(continued)

TABLE XII (continued)

	Max. Rating	Mean Ratings (Values and Percentages)								F Value
		Agents and Specialists (N=25)		Parish Agents (N=13)		Area Agents (N=7)		Specialists (N=5)		
		Value	Percent	Value	Percent	Value	Percent	Value	Percent	
ption	5	3.36	67.2	3.46	69.2	3.29	65.8	3.20	64.0	< 1
olism	5	3.36	67.2	3.46	69.2	3.29	65.8	3.20	64.0	< 1
	5	3.72	74.4	3.54	70.8	4.14	82.8	3.60	72.0	< 1
n)	40	29.10	72.8	28.63	71.6	30.10	75.3	28.94	72.4	< 1
pts										
	5	4.20	84.0	4.20	84.0	4.38	87.6	3.96	79.2	< 1
t	5	3.64	72.8	3.54	70.8	3.76	75.2	3.72	74.4	< 1
	5	3.62	72.4	3.72	74.4	3.66	73.2	3.32	66.4	< 1
ts	5	3.86	77.2	3.96	79.2	3.71	74.2	3.80	76.0	< 1
	5	4.16	83.2	4.12	82.4	4.43	88.6	3.88	77.6	1.37
s	5	3.75	75.0	3.74	74.8	3.91	78.2	3.56	71.2	< 1
ss	5	3.04	60.8	3.39	67.8	2.28	45.6	3.20	64.0	1.88[e]
ent	5	3.95	79.0	3.88	77.6	4.10	82.0	3.92	78.4	< 1
	5	3.78	75.6	3.69	73.8	4.21	84.2	3.40	68.0	1.39
	5	4.32	86.4	4.52	90.4	4.13	82.6	4.06	81.2	1.16
nd facilities	5	3.88	77.6	4.00	80.0	3.86	77.2	3.60	72.0	< 1
nent)	55	42.19	76.7	42.74	77.7	42.44	77.2	40.42	73.4	< 1

20, (e) $P < .25$.

TABLE XII (continued)

Concept	Max. Rating	Mean Ratings (Values and Percentages)						
		Agents and Specialists (N=25)		Parish Agents (N=13)		Area Agents (N=7)		Sp
		Value	Percent	Value	Percent	Value	Percent	Valu
Nutrient(s) absorption	5	3.36	67.2	3.46	69.2	3.29	65.8	3.2
Nutrient(s) metabolism	5	3.36	67.2	3.46	69.2	3.29	65.8	3.2
Feed efficiency	5	3.72	74.4	3.54	70.8	4.14	82.8	3.6
Overall (Nutrition)	40	29.10	72.8	28.63	71.6	30.10	75.3	28.9
Management Concepts								
Dairy records	5	4.20	84.0	4.20	84.0	4.38	87.6	3.9
DHIA management	5	3.64	72.8	3.54	70.8	3.76	75.2	3.7
Sire selection	5	3.62	72.4	3.72	74.4	3.66	73.2	3.3
Herd replacements	5	3.86	77.2	3.96	79.2	3.71	74.2	3.8
Herd health	5	4.16	83.2	4.12	82.4	4.43	88.6	3.8
Effects of stresses	5	3.75	75.0	3.74	74.8	3.91	78.2	3.5
Adaptation to stress	5	3.04	60.8	3.39	67.8	2.28	45.6	3.2
Milking management	5	3.95	79.0	3.88	77.6	4.10	82.0	3.9
Dairy sanitation	5	3.78	75.6	3.69	73.8	4.21	84.2	3.4
Milk quality	5	4.32	86.4	4.52	90.4	4.13	82.6	4.0
Dairy buildings and facilities	5	3.88	77.6	4.00	80.0	3.86	77.2	3.6
Overall (Management)	55	42.19	76.7	42.74	77.7	42.44	77.2	40.4

(b) $P < .05$, (d) $P < .20$, (e) $P < .25$.

other hand, tended to diverge from agent ratings by five to 30 percentage points on four concepts, namely, mating systems, breeding efficiency, artificial insemination and hormones. Only one concept, artificial insemination, showed a statistically significant difference in ratings among the professionals ($F = 7.5$, $P < .05$).

Nutrition Concepts

The most important nutrition concept for agents was balancing rations (81.2 and 88.2 percent). Specialists also ranked this concept high but rated feeding standards (78 percent) most important. Agents felt that ruminant digestion, which includes non-protein nitrogen use, was least important to them in their work (53.8 and 58.6 percent). This concept was ranked fairly high by specialists (72 percent) but the difference was not statistically significant. Nutrient absorption and metabolism were ranked lowest by them (64 percent).

Parish and area agents did not differ very much on how they rated the remaining nutrition concepts. On the other hand, specialists differed considerably from agents on their ratings on balancing rations (74.8 versus 88.2 percent) and with statistical significance on the concept of feeding management ($F = 2.30$, $P < .20$).

Management Concepts

As with the other two disciplines, agents and specialists did not differ widely on their ratings of management concepts. Differences

exceeding 10 percentage points between any two professionals' ratings were observed only in three of the 11 concepts. These were herd health, adaptation to stress and dairy sanitation. The differences were statistically significant only in the case of the adaptation concept ($F = 1.88$, $P < .25$).

Area agents differed from parish agents and specialists as to which concept was most important to the agent in his job. Area agents considered herd health to be most important while parish agents and specialists rated milk quality as the most valuable. With regard to the least important concept, there was unanimity, adaptation to stress being relegated to this position.

Ranking of Concepts

Mean importance ratings by agents and specialists of the several discipline concepts were used to rank the concepts. Concept rankings by the three types of professionals and by all types together are given in Appendix B.

The role of the subject matter specialist is particularly significant in this matter of concept rating. Admittedly, agents on the job have an important part, since they are involved in problem situations and are fairly well aware of their needs. However, if one may quote the analogy of Extension's clientele needing agent assistance to balance and establish priorities of needs, in like manner the subject matter specialist, by virtue of specialization and forward-

looking behavior, has the important function of establishing training priorities for his agents. Consequently, specialist rankings of concepts should be weighted more heavily than agent rankings.

IMPLICATIONS FOR TRAINING

The findings with regard to the present cognitive ability of agents in dairy science concepts and the relative job value accorded by agents and specialists to these concepts have some important implications for in-service training.

The use of the behavior-content matrix of present cognitive ability in determining specific cognitive behavior deficiencies in dairy science concepts has been discussed earlier. The job importance ratings of agents and specialists of the same concepts provides some indication of relative training emphasis. Combining these two sources of information, a reasonably need-based program of training can be developed.

CHAPTER V

THE AREA DAIRY SYSTEM

The basic rationale of specialization and improved work effectiveness inherent in the area concept of Extension work was examined in relation to the functioning of area dairy work in Louisiana.

There are six designated area dairy agents--two in the Southeastern District and four in the Northern District. In addition, the county agent in St. Helena Parish specializes in dairy work and, hence, for the purpose of this study, was considered as an area agent. The rest of the agents in the sample devoted significantly less time to dairy work.

Dairymen in the parishes and areas served by these agents were sampled for their opinion with regard to various aspects of the dairy program of the Cooperative Extension Service. There were 53 respondents from the parish system and 33 respondents from the area system. The basic premise of this opinion poll was that the views of dairymen would reflect the relative operation of the two systems of dairy work in the state. This was gauged by analyzing the differences between the opinions of dairymen in the two systems with regard to two criteria: (a) agent effectiveness, and (b) sources of problem-solving help.

A second dimension of this analysis of the area system was concerned with the attitude of dairymen within this system towards its operation. A comparison of attitude by the two Extension Districts where this system operates was indicated for several reasons. As compared with the Northern District, the Southeastern District has single-county area agents with a wider agent-client ratio (1:324 compared to 1:78). The demand on time and personal attention of the agent is, therefore, greater from a local community client group. In contrast, the area agent in the Northern District, who has multi-county responsibility, ranging from two through six, has a smaller client group scattered over a larger area. Another reason for making this comparison is the fact that the Northern District has dairy herds which are twice as large as those in the Southeastern District. As the results showed, there were differences in attitude favoring the Southeastern District. However, in analyzing these differences, it should be realized that dairymen in the Southeastern District may not be fully aware of the implications of this change, as the work location of agents involved in this district continues to be one parish alone. In addition, while the area agents in the Southeastern District devote 90-100 percent of their time to dairy work, the agents in the Northern District expend less proportion of their time.

RELATIVE OPERATION OF AREA AND PARISH SYSTEMS

Agent Effectiveness

Dairymen in the area and parish systems of personnel assignment in the state were compared with regard to opinion about agent effectiveness, assuming that this would reflect the operational aspects of the two systems.

There were two indices of agent effectiveness: (a) dairy programs, and (b) specific abilities.

Dairy programs. Eleven major dairy programs were commented upon. There was generally a favorable opinion. A comparison of area and parish dairymen with regard to opinion about degree of effectiveness or success of each of these programs is shown in Table XIII.

Disease control was the most successful program in both systems--approximately 95 percent of the dairymen indicating it to be effective to some degree. Artificial breeding was considered very effective by the largest proportion of dairymen--three-fourths of area dairymen and two-thirds of parish dairymen. Ninety percent of the dairymen in the area system considered seven programs to be effective, as compared with five programs considered effective by the same percentage of parish dairymen.

The most ineffective program was complete feeds--32 percent

TABLE XIII

A COMPARISON OF THE OPINION OF DAIRYMEN IN THE PARISH AND AREA SYSTEMS OF EXTENSION PERSONNEL ASSIGNMENT REGARDING WORK EFFECTIVENESS OF AGENTS ACCORDING TO DAIRY PROGRAMS, LOUISIANA, 1971

Percent by Work Effectiveness of Agents											
Parish (N=53)					Area (N=33)						
Very Effective	Effective	Fairly Effective	Ineffective	Total	Very Effective	Effective	Fairly Effective	Ineffective	Total	x^2	P
64	23	6	7	100	76	9	9	6	100	2.95	NS
43	31	17	9	100	40	27	24	9	100	0.68	NS
22	36	21	21	100	25	33	30	12	100	2.01	NS
15	32	21	32	100	27	43	15	15	100	4.75	.20
22	42	21	15	100	24	37	33	6	100	2.84	NS
40	26	26	8	100	46	39	6	9	100	5.85	.15
37	36	21	6	100	43	39	15	3	100	0.83	NS
29	30	30	11	100	34	33	24	9	100	0.59	NS
45	29	17	9	100	43	33	18	6	100	0.51	NS
28	36	19	17	100	21	49	15	15	100	1.40	NS
32	38	15	15	100	24	49	15	12	100	1.12	NS

TABLE XIII

A COMPARISON OF THE OPINION OF DAIRYMEN IN THE PARISH AND AREA SYSTEMS OF EXTENSION PERSONNEL ASSIGNMENT REGARDING WORK EFFECTIVENESS OF AGENTS ACCORDING TO DAIRY PROGRAMS, LOUISIANA, 1971

Dairy Program	Percent by Work Effectiveness of Agents									
	Parish (N=53)					Area (N=33)				
	Very Effective	Effective	Fairly Effective	Ineffective	Total	Very Effective	Effective	Fairly Effective	Ineffective	Tot
Artificial breeding	64	23	6	7	100	76	9	9	6	100
Production records	43	31	17	9	100	40	27	24	9	100
Forage testing	22	36	21	21	100	25	33	30	12	100
Complete feeds	15	32	21	32	100	27	43	15	15	100
Challenge feeding	22	42	21	15	100	24	37	33	6	100
Mastitis control	40	26	26	8	100	46	39	6	9	100
Disease control	37	36	21	6	100	43	39	15	3	100
Breeding problems	29	30	30	11	100	34	33	24	9	100
Calf raising	45	29	17	9	100	43	33	18	6	100
Buildings and structures	28	36	19	17	100	21	49	15	15	100
Milking facilities	32	38	15	15	100	24	49	15	12	100

in the parish system and 15 percent in the area system holding this view. Other programs considered ineffective by at least 10 percent of either group were forage testing, challenge feeding, breeding problems, buildings and structures, and milking facilities.

There was a statistically significant difference between the opinion of area and parish dairymen only on two programs. A higher proportion of dairymen in the area system, as compared with those in the parish system, considered the complete feeds program to be very effective (27 versus 15 percent) and effective (43 versus 32 percent), and a correspondingly lower proportion considered it to be ineffective (15 versus 32 percent). These differences were significant at the .20 level. A similar opinion trend was observed with regard to mastitis control, the only other program showing significant difference of opinion (.15 level).

Specific abilities. Inferences regarding specific agent abilities were drawn from dairymen's opinion regarding problem-solving help by agents, facility of contact with them, and the value of information received from the agents.

Dairymen were questioned about the soundness of decisions they received from agents on individual problems in various aspects of the dairy business to infer about problem-solving ability of agents. A comparison of the area and parish dairymen's opinion with regard to how frequently sound problem-solving help was obtained is given

in Table XIV.

Eighty percent of the dairymen in either of the two systems had had a favorable experience with agents solving their problems in all 12 aspects of the dairy business.

The highest proportion of dairymen in both systems (91 percent of parish dairymen and 97 percent of area dairymen) had received sound decisions one time or another on the use of production records. This aspect of the dairy business is apparently more difficult for dairymen to appreciate, as revealed by studies on its adoption (32, 66, 74). Understandably, therefore, the help that may be received would be highly valued and commended. Artificial breeding was the next most highly rated aspect--only six percent of area dairymen and nine percent of parish dairymen stating that they had never been helped.

Of all the subject matter areas indicated buildings and structures had the highest proportion of area dairymen (21 percent) who had never been helped. Eighteen percent of them had also never received sound decisions with regard to selection of sires and cows, and concentrate feeding. With regard to parish dairymen, 17 percent of them indicated a similar opinion about selection of sires and cows, forage testing, disease control, and milking facilities.

Only two out of the 12 subject matter areas showed a statistically significant difference with regard to the opinion of area and parish dairymen. A significantly higher proportion of parish

TABLE XIV

A COMPARISON OF THE OPINION OF DAIRYMEN IN THE AREA AND PARISH SYSTEMS OF EXTENSION PERSONNEL ASSIGNMENT REGARDING WORK EFFECTIVENESS OF AGENTS ACCORDING TO SOUND DECISIONS RECEIVED IN DIFFERENT ASPECTS OF INDIVIDUAL DAIRY BUSINESS, LOUISIANA, 1971

	Percent by Frequency of Sound Decisions from Agents on Individual Problems											
	Parish (N=53)					Area (N=33)						
	Often	Some-times	Occa-sion-ally	Never	Total	Often	Some-times	Occa-sion-ally	Never	Total	x^2	P
	61	21	9	9	100	61	21	12	6	100	0.43	NS
	45	25	13	17	100	49	18	15	18	100	0.49	NS
	36	32	15	17	100	27	30	24	18	100	1.41	NS
	36	30	19	15	100	37	24	27	12	100	1.04	NS
	43	17	23	17	100	24	37	24	15	100	5.26	.15
	45	21	21	13	100	43	27	18	12	100	0.50	NS
	51	23	13	13	100	49	27	6	18	100	1.53	NS
	40	28	17	15	100	33	37	15	15	100	0.68	NS
	63	15	13	9	100	55	24	18	3	100	3.62	NS
	47	25	11	17	100	30	46	15	9	100	5.30	.15
es	34	30	21	15	100	21	28	30	21	100	2.39	NS
	41	25	17	17	100	27	28	33	12	100	3.86	NS

TABLE XIV

A COMPARISON OF THE OPINION OF DAIRYMEN IN THE AREA AND PARISH SYSTEMS OF EXTENSION PERSONNEL ASSIGNMENT REGARDING WORK EFFECTIVENESS OF AGENTS ACCORDING TO SOUND DECISIONS RECEIVED IN DIFFERENT ASPECTS OF INDIVIDUAL DAIRY BUSINESS, LOUISIANA, 1971

Aspect of Dairy Business	Percent by Frequency of Sound Decisions from Agents on Individual Problems									
	Parish (N=53)					Area (N=33)				
	Often	Some-times	Occa-sion-ally	Never	Total	Often	Some-times	Occa-sion-ally	Never	To
Artificial breeding	61	21	9	9	100	61	21	12	6	10
Selection of sires	45	25	13	17	100	49	18	15	18	10
Selection of cows	36	32	15	17	100	27	30	24	18	10
Breeding problems	36	30	19	15	100	37	24	27	12	10
Forage testing	43	17	23	17	100	24	37	24	15	10
Roughage program	45	21	21	13	100	43	27	18	12	10
Concentrate feeding	51	23	13	13	100	49	27	6	18	10
Calf raising	40	28	17	15	100	33	37	15	15	10
Production records	63	15	13	9	100	55	24	18	3	10
Disease control	47	25	11	17	100	30	46	15	9	10
Buildings and structures	34	30	21	15	100	21	28	30	21	10
Milking facilities	41	25	17	17	100	27	28	33	12	10

dairymen (43 percent), as compared with area dairymen (24 percent), had been helped often on forage testing problems. However, there was practically no difference with regard to the proportions who had never been helped. In contrast, a larger percentage (17 percent) of parish dairymen said they had never been helped on disease control problems, as compared with nine percent of the area dairymen. As with forage testing, more parish dairymen had been helped often and a smaller number sometimes, as compared with area dairymen. In both subject matter areas, the differences between the views of area and parish dairymen were statistically significant at the .15 level.

Some inferences can be drawn from the reactions of the two groups of dairymen to these two dimensions of agent effectiveness, namely, dairy programs and problem-solving help. In contrast with the proportion of dairymen who had expressed a favorable opinion about general effectiveness of programs (about 90 percent: Table XIII), a smaller percentage (about 80 percent: Table XIV) felt that they had received sound decisions on their individual problems at one time or another. Also, there were fewer subject matter areas (two or three) in which help had been received more or less frequently by at least 90 percent of the dairymen, as compared with the greater number of such areas which had been considered effective (five to seven) by a similar proportion. Apparently, this increase in unfavorable opinion could be ascribed to the change in the frame of reference of dairymen's opinion from an impersonal reaction about general programs to a

personal examination of more specific, individualized problems which is likely to evoke more critical observation.

The facility of contact with agents is generally indicative of dairymen's esteem. A comparison of the opinions of the two groups is given in Table XV.

Dairymen in both systems appeared to be well satisfied with the availability of agents when needed by them. Practically none of the dairymen stated that agents were never available, thus indicating that agents were available on call with more rather than less frequency. There was no statistically significant difference between the two groups in this regard. However, with respect to visitation by agents to dairymen for various purposes, the difference between the views of area and parish dairymen was significant at the .20 level. One-fourth of parish dairymen stated that agents had never visited them within the last six months, as compared with about one-seventh of the area dairymen who had experienced this. Slightly higher percentages of area dairymen than parish dairymen also had been visited more frequently by their respective agents. This difference in favor of the area system conflicts with the popular notion that area agents find less time to make farm visits owing to the enlarged area of operation. The three area agents in the Southeastern District, however, have single-county responsibility owing to high concentration of dairy herds. This could be a partial explanation. The basic realism of differences in agent effectiveness cannot also be excluded.

TABLE XV

A COMPARISON OF DAIRYMEN IN THE PARISH AND AREA SYSTEMS OF EXTENSION PERSONNEL ASSIGNMENT ACCORDING TO FACILITY OF CONTACT WITH DAIRY AGENTS, LOUISIANA, 1971

Percent by Facility of Contact with Agents												
Parish (N=53)					Area (N=33)							
Often	Some-times	Occa-sion-ally	Never	Total	Often	Some-times	Occa-sion-ally	Never	Total	x^2	P
69	12	16	3	100	67	18	15	0	100	1.37	NS
17	34	23	26	100	16	40	29	15	100	5.53	.20

TABLE XV

A COMPARISON OF DAIRYMEN IN THE PARISH AND AREA SYSTEMS OF EXTENSION PERSONNEL ASSIGNMENT ACCORDING TO FACILITY OF CONTACT WITH DAIRY AGENTS, LOUISIANA, 1971

Type of Contact	Percent by Facility of Contact with Agents									
	Parish (N=53)					Area (N=33)				
	Often	Some-times	Occa-sion-ally	Never	Total	Often	Some-times	Occa-sion-ally	Never	T
Availability	69	12	16	3	100	67	18	15	0	
Visitation	17	34	23	26	100	16	40	29	15	

The opinion of dairymen regarding the usefulness of information put out by area and parish agents in the form of circular letters and through the news media is compared in Table XVI.

Both forms of information were credited with being useful to some degree. Information disseminated via the news media was equally useful to both groups of dairymen. With regard to circular letters, there was a significant difference of opinion about the extent of usefulness (.20 level). Higher percentages of parish dairymen (48 and 24 percent) regarded them as being very useful and slightly useful, compared with area dairymen (30 and 12 percent). On the other hand, nearly three-fifths of area dairymen considered circular letters quite useful in comparison to slightly over one-fourth of parish dairymen.

Sources of Problem-Solving Help

The area agent is expected to be more specialized and competent in subject matter than the parish agent. Consequently, one would expect that dairymen in the area system--particularly the more specialized--would rely to a greater extent on the Extension agent than on others. Table XVII, which compares the two groups of dairymen in this regard, does not substantiate this assumption.

In the first place, a higher proportion of parish dairymen (46 percent) sought problem-solving help more often than area

TABLE XVI

A COMPARISON OF DAIRYMEN IN THE PARISH AND AREA SYSTEMS OF EXTENSION PERSONNEL ASSIGNMENT ACCORDING TO OPINION REGARDING USEFULNESS OF INFORMATION RECEIVED FROM DAIRY AGENTS, LOUISIANA, 1971

Percent by Usefulness of Agent Information											
Parish (N=53)					Area (N=33)						
Very Useful	Quite Useful	Slightly Useful	Not Useful	Total	Very Useful	Quite Useful	Slightly Useful	Not Useful	Total	x^2	P
48	28	24	0	100	30	58	12	0	100	4.34	.20
49	33	18	0	100*	47	37	16	0	100	1.82	NS

pondents who indicated their agents did not use the news media.)

TABLE XVI

A COMPARISON OF DAIRYMEN IN THE PARISH AND AREA SYSTEMS OF EXTENSION PERSONNEL ASSIGNMENT ACCORDING TO OPINION REGARDING USEFULNESS OF INFORMATION RECEIVED FROM DAIRY AGENTS, LOUISIANA, 1971

Form of Information	Percent by Usefulness of Agent Information									
	Parish (N=53)					Area (N=33)				
	Very Useful	Quite Useful	Slightly Useful	Not Useful	Total	Very Useful	Quite Useful	Slightly Useful	Not Useful	T
Circular Letters	48	28	24	0	100	30	58	12	0	
News Media	49	33	18	0	100*	47	37	16	0	

(* Excludes 8 respondents who indicated their agents did not use the news media.)

TABLE XVII

A COMPARISON OF DAIRYMEN IN THE PARISH AND AREA SYSTEMS OF EXTENSION PERSONNEL ASSIGNMENT ACCORDING TO SOURCES OF PROBLEM-SOLVING HELP, LOUISIANA, 1971

	Percent Seeking Problem-Solving Help											
	Parish (N=53)					Area (N=33)						
	Often	Some-times	Occa-sion-ally	Never	Total	Often	Some-times	Occa-sion-ally	Never	Total	x^2	P
	46	24	27	3	100	37	33	27	3	100	8.00	.05
	18	28	32	22	100	15	43	30	12	100	9.53	.025
staff	13	22	32	33	100	12	32	42	14	100	4.95	.20
s	12	20	42	26	100	20	28	26	26	100	3.89	NS

TABLE XVII

A COMPARISON OF DAIRYMEN IN THE PARISH AND AREA SYSTEMS OF EXTENSION PERSONNEL ASSIGNMENT ACCORDING TO SOURCES OF PROBLEM-SOLVING HELP, LOUISIANA, 1971

Source of Help	Percent Seeking Problem-Solving Help									
	Parish (N=53)					Area (N=33)				
	Often	Some-times	Occa-sion-ally	Never	Total	Often	Some-times	Occa-sion-ally	Never	Tot
Extension agent	46	24	27	3	100	37	33	27	3	10
State specialist	18	28	32	22	100	15	43	30	12	10
Experiment station staff	13	22	32	33	100	12	32	42	14	10
Commercial dealers	12	20	42	26	100	20	28	26	26	10

dairymen (37 percent). A smaller proportion of them (24 percent) sought help sometimes, as compared with the area dairymen (33 percent). This difference was statistically significant at the .05 level. The assumption of less reliance by area dairymen on other-than-agent sources was further invalidated when state specialists and Experiment Station staff were considered. Lower percentages of area dairymen (12 and 14 percent), as compared with parish dairymen (22 and 33 percent), had never sought help from state specialists and Experiment Station staff, thus indicating greater reliance on these sources than upon the agent.

There was practically no difference between the two groups of dairymen contacting state specialists often and occasionally, although more area dairymen (43 percent) contacted specialists sometimes, compared with fewer parish dairymen (28 percent). The differences between the two groups were significant at the .025 level.

Area and parish dairymen showed smaller differences in contacting Experiment Station staff than state specialists, although the difference was still statistically significant at the .20 level. The differences lay in the higher proportion of area dairymen (74 percent) who sought help sometimes and occasionally, as compared with the lower proportion of parish dairymen (54 percent) who went to the Experiment Station staff.

While there was a difference between the area and parish dairymen with regard to the extent of problem-solving help from

commercial dealers, this difference was not statistically significant.

As shown above, the area dairymen tended to rely more on state specialists and Experiment Station staff than on Extension agents, contrary to the premise that increased specialization would make the area agent a more frequently sought source of help. One needs, however, to consider factors like agent identification with clientele, facility of contact, etc., while drawing such inferences.

ATTITUDE OF DAIRYMEN TO AREA DAIRY WORK

The reaction of dairymen to the working of the area concept in the two Extension districts is summarized in Table XVIII. Twelve statements about area dairy work were presented for reaction on a five-point scale from strongly agree through strongly disagree. The responses of dairymen were scored and summed to give overall attitude scores. The possible range of scores was 12 through 60. The statements were grouped into five main types of experiences with area work, and the responses were distributed over three categories of attitude. The table compares the attitude of dairymen in the Northern and Southeastern Districts.

Dairymen in the Southeastern District had a more favorable attitude towards area dairy work. They had a higher mean attitude score (42.58) than dairymen in the Nothern District (36.45). This difference was statistically significant at the .05 level of significance.

TABLE XVIII

A COMPARISON OF THE ATTITUDE OF DAIRYMEN IN THE NORTHERN AND SOUTHEASTERN EXTENSION DISTRICTS TOWARD AREA DAIRY WORK ACCORDING TO TYPE OF EXPERIENCE LOUISIANA, 1971

Type of Experience	Percent of Dairymen By Attitude Towards Area Dairy Work								x^2	P
	Northern District (N=20)				Southeastern District (N=12)					
	More Favorable	Uncertain	Less Favorable	Total	More Favorable	Uncertain	Less Favorable	Total		
Program effectiveness	45	35	20	100	75	25	0	100	3.84	.20
Specialized help from agent	55	25	20	100	75	25	0	100	2.88	NS
Facility of contact with agent	35	40	25	100	58	25	17	100	1.66	NS
Attending out-of-parish meetings	0	35	65	100	33	17	50	100	7.85	.025
"Identity" of parish not "lost"	55	15	30	100	58	33	9	100	2.78	NS
Attitude:										
Mean		36.45				42.58				
Range		17-44				34-53				

F = 5.42* with 1 and 30 df.

Considering attitude by type of experience, it was observed that the dairymen's reactions to the effectiveness of the respective district programs and the relative ease with which they could attend out-of-parish meetings were significantly different, statistically (.20 level and .025 level, respectively). In both cases, a considerably higher proportion of dairymen in the Southeastern District (75 and 33 percent), as compared with those in the Northern District (45 and 0 percent), expressed a favorable attitude. While the finding with regard to program effectiveness could be considered valid, the attitudinal difference with respect to attendance at out-of-parish meetings should be considered in the context of single-county responsibility of the area dairy agents in the Southeastern District. The less favorable attitude of dairymen in the Northern District may be a more valid estimate of this particular problem, which has often been cited against area work.

Although the remaining types of experience did not show statistically significant attitude differences, the dairymen from the two districts did not also agree in their reactions. With regard to receiving specialized help from agents and also facility of contact with them, the dairymen in the Southeastern District had a more favorable attitude--75 and 58 percent, compared with 55 and 35 percent, respectively. None of the dairymen in the Southeastern District had had an unfavorable experience in receiving specialized help, while as many as 20 percent of those in the Northern District held this opinion.

One of the important considerations in area dairy work is the anticipated adverse community reaction to the "loss" of the county agent. This was apparently borne out by the higher proportion of dairymen in the Northern District (30 percent), compared with the Southeastern District (9 percent), who felt that the "identity" of the parish with the work of the agent had been somewhat affected by the area system.

CHAPTER VI

SUMMARY AND CONCLUSIONS

SUMMARY

Continued professional improvement, through in-service training, is essential to keep pace with the rapid social and technological changes in modern society. Cooperative Extension Services in the United States, generally, have emphasized in-service training and based such programs on professional needs, evaluated in terms of subject matter, programs and job performance. Intellectual or cognitive ability of Extension professionals in relation to job specialization as a means of determining training needs is an area of limited research. The major objective of the study, therefore, was to develop a conceptual framework integrating selected features of curriculum and learning theory for determining cognitive needs of Extension agents and to demonstrate the application of this model to the discipline of dairy science.

Tyler's concept of educational objectives (curriculum theory) and Bloom's taxonomic classification of cognitive behavior (learning theory) were used along with the element of work effectiveness to build the conceptual framework.

In applying this framework to the field of dairy science, data was collected from 20 Extension agents engaged in dairy work in Louisiana, five state specialists in dairy and veterinary science, and 86 dairymen over the state.

The data was analyzed on two major dimensions, namely, agent cognitive ability and relative work value of dairy science concepts. Concepts which had been developed in the three major dairy science disciplines--breeding, nutrition and management--were rated by agents and specialists in terms of importance in the job of the agent and were also tested on agents at three levels of cognitive behavior.

Three dimensions of agent cognitive ability, comparing parish and area dairy agents, were studied. Overall cognitive ability in dairy science was correlated with agent characteristics and discipline cognitive ability with concept ratings. Agent performance at the cognitive levels sampled was incorporated into a behavior-content matrix to compare the present ability of parish and area agents and to relate this to expected ability.

The views of agents and specialists with regard to the job importance of dairy science concepts were compared to see the extent of congruence.

A subsidiary objective of the study was to take stock of the operation of the parish and area systems of dairy work in Louisiana.

This was done by comparing the operational aspects of the two

systems and by feeling out dairymen on their attitude towards area dairy work.

The major findings of the study are summarized and discussed in the perspective of in-service training.

Agent Characteristics

The sample of agents was about 50 years old, with an average Extension tenure of approximately 20 years. Parish agents had served about five years longer in Extension or in dairy work than area agents. The latter had been in area dairy work from one through six years.

Two-thirds of the agents had majored in agriculture at the undergraduate level and a similar proportion in Extension Education at the graduate level.

Parish and area agents participated equally in professional associations and organizations and had the same number of contacts with research staff. The former attended a larger number of training meetings, but the latter had greater exposure to dairy training activities and more contacts with specialists.

Area agents spent more time, on an average, than parish agents in seeking out new information; they also referred to a greater number of information sources and read more magazines.

Specialists consistently rated area agents higher than parish agents on all aspects of their job for which reaction was sought--

problem identification, planning, innovativeness and subject matter abilities. Dairymen, on the other hand, considered area agents superior in three aspects--general program effort, seeking of problem-solving help and value of agent information--and parish agents superior in two aspects--individual problem-solving and facility of contact.

Agent Cognitive Ability

Area agents scored slightly higher than parish agents in all the three disciplines and consequently had a higher overall score. The greatest difference was in nutrition (8.3 percent) and the smallest in management (1.5 percent), with an overall difference of 4.5 percent. None of these differences was statistically significant.

Differences between the two agent types were somewhat greater at specific discipline-cognitive behavior level combinations. For example, area agents compared with parish agents had significantly greater evaluative ability in nutrition (15.6 percent, $P < .01$), perceptibly higher comprehension-application ability in management (9.5 percent), and better knowledge of management (15.5 percent) and overall subject matter (11.1 percent). At all other behavior levels, parish and area agents tended to be alike in ability.

Extending the comparison between parish and area agents to cognition of the several dairy science concepts sampled, major differences (exceeding ten percentage points) were observed in 20 out

of the 35 concept-cognitive level combinations, or approximately 57 percent. Area agents were superior in 14 instances, four of which were statistically significant, and parish agents in the remaining six, of which two cases were statistically significant. Considering knowledge, area agents had higher ability in the concepts breeding efficiency/artificial insemination (21.5 percent), metabolism (31.5 percent, $P<.20$), herd health (25.5 percent), stress (26.5 percent), adaptation (15 percent) and overall management (15.5 percent), and lower knowledge of hormones (13 percent, $P<.25$), and ruminant digestion (13 percent). With respect to the ability to comprehend and apply concepts, area agents were better than parish agents in breeding efficiency/artificial insemination (10 percent), production records (15.2 percent), herd management-feeding (11.3 percent) and overall management (9.5 percent), and poorer in herd health (10 percent). In evaluative or problem-solving ability, area agents displayed higher ability than parish agents with regard to the concepts feed evaluation/standards (12.7 percent, $P<.25$), balancing rations (19.1 percent), herd health (32.5 percent, $P<.20$) and overall nutrition (15.6 percent, $P<.20$) and lower ability in heritability (14.7 percent, $P<.25$), heifer management (14.2 percent) and animal housing (16 percent).

In summary, area agents tended to have slight to fair superiority in cognitive ability in dairy science subject matter and in the disciplines of breeding, nutrition and management. They also showed higher ability in a larger proportion of discipline-cognitive level and

concept-cognitive level combinations than did the parish agents and registered a higher incidence of statistically significant differences. Greater job specialization could be partly responsible for differences favoring the area agents. A number of other factors may also be involved. These were studied by correlating overall cognitive ability with agent characteristics.

Grade point average (graduate) and dairymen ratings of agents were positively correlated with cognitive ability, regardless of agent type. Mean grade point averages of parish and area agents were almost similar and, hence, could not be implicated for the difference in cognitive ability. Mean job effectiveness ratings by dairymen were higher on three items for area agents and on two items for parish agents. The correlations of these ratings with cognitive ability were higher in the case of area agents and statistically significant in four of the five job items.

Age and agent contacts with specialists and research staff, regardless of agent type, were negatively correlated with cognitive ability. The average age of both types of agents was similar and could not, therefore, have been responsible for the differential cognitive ability. Area agents had twice as many contacts, on an average, with specialists and the same number of contacts with research staff as parish agents. The greater opportunity in the area agent's position for dealing with problems which was reflected in the higher specialist contact could have contributed to the superior

performance of this group. However, the negative correlation indicated that the higher-ability agents, regardless of type, had less need for problem-solving specialist contact than those with lower ability.

For all the remaining characteristics, positive correlation with cognitive ability was expected. This was not observed. On the other hand, parish and area agents invariably recorded an opposite correlation in the case of each characteristic. Parish agents with higher cognitive ability had longer tenure in Extension, dairy and supervisory work, had membership in more professional associations, referred to a larger number of information sources and magazines, and received significantly higher specialist ratings on the total program for ability to identify problems, plan programs and innovate, and for subject matter competence than those parish agents who had lower ability. These agents also participated in significantly fewer dairy and other training activities and professional associations, and spent significantly less time in seeking out new information on dairy science. In contrast, area agents with high cognitive ability had less tenure, referred to fewer information sources and magazines but spent more time gathering new information, participated in a larger number of training and professional activities but received lower specialist ratings on all job items, than area agents who had lower ability. Several of the contradictory correlations shown by parish and area agents can be explained on the basis of individual situation

differences. For example, while one can logically assume that greater training participation, technical contacts and active information seeking are more likely than not to be positively associated with cognitive ability, factors such as inadequate time, opportunity, inclination, etc. may mitigate against the consistency of such associations. As it is not possible to control the host of likely variables, inconsistent correlations are not unexpected.

The performance of parish and area agents at the concept-cognitive level combinations sampled was incorporated into a behavior-content matrix of present ability. When this was compared with expected ability, a discrepancy was invariably observed, indicating that no single concept had been fully mastered; furthermore, the discrepancy was noticed in more concept-cognitive level combinations in the case of parish agents than area agents, suggesting the need for differential training emphases for the two types of agents.

Pursuing cognitive ability further, it was anticipated that agents with high ability would tend, in terms of job importance, to rate more importantly a larger number of discipline concepts, and that they, in turn, would be estimated more highly on subject matter ability by specialists. As it turned out, however, neither of the two sets of correlations followed a pattern.

Both parish and area agents were inconsistent in their ratings. Parish agents with higher ability rated two out of three conceptual frameworks (discipline) more highly, while area agents with higher

ability rated only one such conceptual framework.

Specialist estimates of agent ability did not correspond with actual agent performance entirely. While there was fair to good agreement between specialist ratings and the tested cognitive ability of parish agents in the three disciplines, there was a significant negative correlation in the case of area agents in two disciplines.

In view of the conflicting results, neither agent ratings of the job importance of dairy science concepts nor specialist ratings of the subject matter ability of agents appear to be reliable indices of the cognitive ability of agents.

Job Importance of Dairy Science Concepts

The importance of dairy science concepts in the job of the agent was commented upon by the two agent types and the specialists. Twenty-five major concepts were rated in the three disciplines.

In this context, the role of the specialist in evaluating agent training needs is particularly significant and should be given considerable weight.

Specialists and agents agreed that management concepts were most important, followed by nutrition and breeding. However, the difference between the highest and lowest rated discipline was only 6.7 percentage points.

There were 11 major concepts in management to be rated. Milk quality, dairy records and herd health were rated within the top

five concepts by agents and specialists alike. Adaptation and sire selection were ranked towards the bottom of the scale by these professionals. There was some measure of disagreement with regard to the relative importance of the remaining concepts. There was highest disagreement on dairy sanitation, area agents ranking it third and parish agents and specialists ninth in order of importance.

Eight nutrition concepts were rated. Parish and area agents were quite close on their respective ratings of these concepts. They considered balancing rations, feeding standards, feed evaluation systems and feed efficiency as the more important concepts and ruminant digestion, nutrient absorption and metabolism and feeding management as less important. Specialists tended to diverge to some extent from the agents; for example, they considered feeding management to be more important than balancing rations and digestion more so than nutrient absorption and metabolism.

Disagreement between agents and specialists was more marked in their ratings of two of the six breeding concepts. Agents ranked artificial insemination at the top while specialists felt it least important, considering that breeding technicians assist dairymen in this activity more than agents. Similarly, selection was considered relatively unimportant by agents but specialists felt otherwise. Breeding efficiency was top ranked by area agents and specialists and third by parish agents. Mating systems was ranked fifth or last in importance.

Viewing these ratings in the context of training emphasis, it would appear logical to assume that the respective rankings of the two types of agents are a reliable index of training priorities as seen by them. The next step is to compare the two sets of rankings with specialist ratings. Where there is significant disagreement on the relative importance of some concepts, it would be appropriate to give more weight to specialist ratings.

The data on cognitive ability in dairy science concepts and the relative work value of these concepts can be integrated into a design for in-service training of agents. Deficiencies in the intellectual map of agents in various concept-cognitive level combinations have been identified. Similarly, the concepts that are considered more important than others have been indicated. With this information, it would be possible to assign priority in terms of training emphases to the several concepts at various cognitive behavior levels with a reasonable degree of confidence that real educational needs and objectives will be satisfied.

The Area Dairy System

Area Extension work has been commended as a means of meeting more satisfactorily than the traditional parish system the technological needs of an increasingly specialized clientele. At the same time, skepticism has been expressed regarding its effect on traditional agent-client relationships. These were the major

considerations in examining the operational aspects of the parish and area systems of dairy work in the state.

Fifty-three dairymen in the parish system and 33 dairymen in the area system commented upon various aspects of the dairy programs of the Cooperative Extension Service. Relative operation of the two systems and the attitude of dairymen within the area system were studied.

There was a significant difference of opinion (.20 level) between area and parish dairymen regarding the general effectiveness of only two of the 12 dairy programs organized, namely, complete feeds and mastitis control. This was to the advantage of the area system. With respect to individual problem-solving help from agents, again only two out of 12 subject areas showed significant difference (.15 level) in dairymen's opinions. More dairymen in the parish system than in the area system considered agent help in forage testing to be valuable; at the same time, more of them felt that no help had been received on disease control problems. Dairymen in both systems were well satisfied with agent availability on call; with regard to agent visitation, there was greater dissatisfaction among dairymen in the parish system than in the area system. There was no major difference in dairymen's views regarding the value of information received from the agent.

The premise that the more specialized area agent would be relied upon to a relatively greater extent by dairymen than other

problem-solving sources, as compared with the more generalized parish agent, was not substantiated in the study. On the contrary, area dairymen tended to rely less on Extension agents and more on state specialists and Experiment Station staff. Parish dairymen displayed the opposite tendency.

In summary, the area system of dairy work was reportedly superior to the parish system with regard to two program areas, complete feed and mastitis control, one problem area, disease control, and more frequent agent visitation. On the other hand, the parish system was better than the area system with regard to problem-solving help in forage testing, and the greater reliance on the parish agent for subject matter help. No differences were observed between the two systems in 10 program areas, 10 problem areas, agent availability and the value of agent information. It would appear that the area and parish systems did not differ very much in the efficacy of various operations. Considering that area dairy work is fairly recent and that training effort for area staff specialization has been limited, the small difference is not surprising. Whatever differences may have been observed may not also be the effect of the system, per se, but could be caused by a number of factors, such as differential agent ability, differences among dairymen, etc. Furthermore, the frame of reference on which the study is based is the opinion of dairymen, which by itself is rather subjective and can cause further variation in the results.

Of interest also was the attitude of dairymen in the Northern and Southeastern Districts to area dairy work. Dairymen in the Southeastern District had a more favorable attitude (significant at .05 level). Five types of experiences were summarized into attitude. On all of these experiences, dairymen in the Southeastern District registered a more favorable attitude than dairymen in the Northern District. Attitude differences were statistically significant for two of these experiences--program effectiveness and attending out-of-parish meetings. For the remaining experiences--specialized help from agents, facility of contact with agents, and preserved "identity" of the parish--considerable difference in attitude was observed.

The more favorable attitude of dairymen in the Southeastern District could be the result of continued single-county responsibility for the area agents in this district, the relatively higher proportion of time that they devote to dairy work, and the relatively smaller-sized dairy operations in the district. At the same time, agents in the Southeastern District are responsible to about four times the audience size in the Northern District, and this could adversely affect dairymen's attitudes. This is compensated, however, by the fact of single-county responsibility of the area agents in the Southeastern District so that dairymen probably continue to identify the area agent with the traditional parish system. Area agents in the Northern District, on the other hand, have multi-county responsibility and may have encountered more of those problems which are peculiar

to an enlarged area of operation. In view of these circumstances, it would appear that the attitude of dairymen observed in the study is a reflection not of the working of the area system in the two districts, but rather of the dairy program as such.

CONCLUSIONS

Training Development Process

The conceptual framework used in the study as a training development procedure has a sound theoretical base and was scientifically and successfully applied to a technical discipline. The process was reliable and valid in sampling desired intellectual behaviors and opinions by virtue of pretest and expert judgment. It is suggested that the procedure be extended to other technical disciplines for possible refinements and/or increasing its reliability and validity as an analytical tool.

The analytical procedure should be tried in process areas such as programming, teaching-learning, communication, etc. to see what modifications, if any, are needed.

The process indicated is a unique effort and should compare favorably with training development procedures which have been generally followed. It has the singular advantage of direct, in-depth assessment of relevant cognitive behavior and yields a more reliable index of training need than indirect evaluations.

The process can be commended for objectivity in evaluating professional abilities and for specificity in comparing a range of concept-cognitive level combinations in terms of expected competencies. The result is a more reliable and meaningful program of in-service training.

Some important questions that arise in the use of this framework are:

a) Is the "real" norm of expected ability typically job-related to the extent that individual considerations and judgments can be overlooked?

b) What is the emotional reaction among professionals to ability evaluation?

c) What are the administrative/supervisory implications of the extended long-term application of training development processes of this nature?

d) What is the role of staff development specialists in decisions about and organization of training development procedures?

Training Content

The concept of differential training priorities and emphases is related basically to job requirements and the cognitive ability needed to meet these requirements.

Degree of job specialization, relative use and cognitive ability should dictate the number and complexity of concepts that are incorporated into training programs. Hypothetically, parish and area agents in Extension work could be at variance on all these criteria.

The study revealed real to significant differences between parish and area dairy agents in cognition of a number of concepts and the job importance ratings of dairy science concepts. Training content for these groups should consider these differences in order to plan for differential training emphases. Subject matter specialists should play a significant leadership role with regard to current and future training of dairy agents.

The Parish-Area Systems of Dairy Work

The study showed that dairymen in the area system had a slightly better opinion about the effectiveness of some aspects of dairy work than those in the parish system. The difference was too small to make valid conclusions about relative superiority. Area dairy work is quite recent, so that dairymen are not fully aware of its implications and may not have felt its possible impact. In addition, there is little difference in dairy specialization between parish and area agents. These and other factors are implicated in the observed results.

The significantly favorable attitude of dairymen in the Southeastern District, compared with the Northern District, is not

a completely reliable index of the working of the area system, per se. Factors such as single-county responsibility which leads to better client identification, smaller dairy operators, etc. could well have contributed to the differences.

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APPENDICES

APPENDIX A

TRAINING NEEDS OF DAIRY AGENTS IN LOUISIANA, 1971

Part 1: General

Name of Agent _____

Parish/Area _____

A. Extension Background

1. How long have you been employed in Extension work? _____ Years

2. How many years out of this time would you say have been devoted mainly to dairy Extension work? _____ Years

3. For how long have you served in the positions of:

	Years
4-H Agent	_____
Assoc. County Agt.	_____
County Agent	_____
Area Agt. (Dairy)	_____

4. Would you say that you have spent about three-fourths of your life before you took up a full-time professional job in a rural or urban area?

Rural	_____
Urban	_____

B. Education and In-Service Training

5. Would you please indicate your major field for the Bachelor's and Master's degree?

	BS/MS.
General Agric.	_____
Agronomy	_____
Animal Science	_____
Agric. Economics	_____
Extension Educ.	_____
Dairy Science	_____
Horticulture	_____
Voc. Agric.	_____
Other (please specify)	
_____	

6. Do you recall how many agent training meetings you attended during the last two years? Number _____

7. Do you recall how many training workshops you attended during the last two years? Number _____

8. Do you recall how many training sessions of other kinds, like dairy schools, short courses, etc. you attended during the last two years? Number _____

9. If you put together all these in-service training activities of the two years, do you recall the approximate proportion of these that were devoted mainly to dairy training?
   - All _____
   - About three-fourths _____
   - About one-half _____
   - About one-fourth _____

C. Information-Seeking and Professional Contact

10. During the last year, how many times have you contacted of your own accord Extension and Research Specialists?

	No. Times Contacted
State Dairy Specialist	_____
State Agronomy Specialist	_____
State Veterinary Specialist	_____
LSU Research Staff	_____
Local Experiment Station Staff	_____
Out-of-State Specialists	_____

11. Would you say that these contacts were made for the purpose of gathering some needed subject matter information that you did not know and/or understand?
   - Often _____
   - Sometimes _____
   - Occasionally _____
   - Never _____

12. Again, would you say that these contacts were made for the purpose of getting specialist help in solving some dairy problems which you felt you could not handle yourself?

Often _____
Sometimes _____
Occasionally _____
Never _____

13. Do you recall the number of times the various State Extension Specialists have been in contact with you for problem-solving help over the past year?

	No. Times Visited
Dairy Spec. (Nut.)	_____
Dairy Spec. (Herd Health)	_____
Dairy Spec. (Records)	_____
Dairy Spec. (Herd Replacement)	_____
Veterinary Spec.	_____
Agronomy Spec.	_____

14. Do you seek out information about new developments in dairy production?

Often _____
Sometimes _____
Occasionally _____
Never _____

15. How much time would you say you spend in a month on getting new information?

Hours _____

16. For getting this information, which sources do you use? (Check all that apply.)

Specialists _____
Researchers _____
Books _____

Magazines
Hoards Dairyman _____
Farm Journal _____
Farm Technology _____
Progressive Farmer _____
Journal of Dairy Science _____
Journal of Extension _____
Others _____
_____

17. Do you recall how many field days you organized during the last two years with different groups such as dealers, public and private institutions, farmers, etc. ?

Number _____

18. How frequently have you attended the field days at LSU and nearby Experiment Stations?

Very _____
Fairly _____
Somewhat _____
Rarely _____

19. Would you please now tell us the associations and organizations with which you actively work in your dairy program or in which you may be an associate member?

LABC _____
La. Cattlemen's Association _____
La. Commercial Agric. Workers _____
Dairy Fieldmen's Association _____
Farm Bureau _____
Other_____
_____

20. Of which professional associations (learned societies) are you an active member?

State/Nat'l. County Agts. Association _____
Epsilon Sigma Phi _____
American Dairy Sc. Association _____
Phi Kappa Phi _____
Gamma Sigma Delta _____
Other_____
_____

Part 2:

Agent Opinion Regarding the Work Value of Dairy Concepts

Agents involved in dairy extension work probably need to know and use many concepts or ideas to bring about educational change among their dairymen. Based on present-day knowledge of dairy production, sets of concepts have been developed in three areas, dairy cattle management, dairy cattle nutrition and dairy cattle breeding and physiology. Some of these concepts may be more important than others in the work of agents. You are requested, therefore, to examine each concept listed in the attached sheets and indicate in the appropriate category the extent to which you consider it of importance or value in your job situation in dairy extension. Please ensure that each concept is considered and your choice of work value indicated.

CONCEPTS IN DAIRY CATTLE MANAGEMENT

Relative Importance in Agent's Job

Concept	Absolutely Essential	Major Importance	Considerable Value	Some Value	Little Value
1. Dairy Records					
Identification					
Feeding					
Production					
Health					
Reproduction					
Financial					
2. DHIA Management Factors					
Projected M.E.					
Rating					
Reproductive Status					
Income/Feed Cost					
Lactation Persistency					
Cow Index					
3. Sire Selection					
Predicted Difference (Milk)					
Predicted Difference (Type)					
Repeatability					
4. Herd Replacements					
Purchase					
Raising					

Concept	Absolutely Essential	Major Importance	Considerable Value	Some Value	Little Value
5. Herd Health Program					
Immunizations					
Disease Control					
Nutritional Deficiencies (vitimins, minerals, etc.)					
Infections (bacterial, virus)					
Metabolic Disorders (Mastitis, Milk Fever, Ketosis, etc.)					
6. Effects of Stresses					
Climatic Stress					
Nutrition Stress					
Production Stress					
Reproduction Stress					
7. Adaptation to Stress					
8. Milking Management					
Milking Equipment					
Types					
Maintenance					
Milking Procedure					
9. Dairy Santitation					
Types of Detergents/ Sanitizers					
Procedures					
10. Maintaining Milk Quality					
Chemical					
Bacteriological					
Milk Cooling					
11. Dairy Buildings and Facilities					

CONCEPTS IN DAIRY CATTLE NUTRITION

Relative Importance in Agent's Job

Concept	Absolutely Essential	Major Importance	Considerable Value	Some Value	Little Value
1. Feed Evaluation Systems					
Chemical Composition					
Digestibility (TDN, DCP, etc.)					
Energy					
Protein					
2. Feeding Standards (NRC)					
Maintenance					
Growth					
Reproduction					
Lactation					
3. Balancing Rations					
Roughages					
Concentrates					
Minerals					
Vitamins					
4. Feeding Management					
Forage Analysis (Big Q)					
Ready Mixed Concentrates					
Complete Feeds					
Pasture vs. Dry-lot					
Challenge Feeding					
Group Feeding					
Least-cost Rations					

Concept	Absolutely Essential	Major Importance	Considerable Value	Some Value	Little Value
5. Ruminant Digestion					
Non-Protein Nitrogen (urea, etc.)					
Other Nutrients					
6. Nutrient(s) Absorption					
7. Nutrient(s) Metabolism					
8. Feed Efficiency					

CONCEPTS IN DAIRY CATTLE BREEDING AND PHYSIOLOGY

Relative Importance in Agent's Job

Concept	Absolutely Essential	Major Importance	Considerable Value	Some Value	Little Value
1. Selection					
Individual					
Sib (Sisters)					
Progeny (Daughter Herdmates)					
Indirect					
Simultaneous					
2. Mating Systems					
Inbreeding					
Outbreeding					
3. Heritability					
4. Breeding Efficiency (Age First Service, Calving Interval, Hard Breeding, etc.)					
5. Artificial Insemination					
Reproductive Systems					
Semen Evaluation					
Semen Processing					
Insemination Techniques					
6. Hormones					
Milk Production					
Reproduction					
General Metabolism					

Part 3:

Training Need of Agents for Dairy Concepts

This part contains 45 questions on various aspects of dairy production. The questions range from knowledge to comprehension and evaluation of selected concepts. The questions are divided into three sections. There are 15 questions in each section. The sections are:

Section A: Definitions

Section B: Cause-effect relationships

Section C: General subject matter

In Sections A and B, there is only one correct answer to each question.

In Section C, kindly encircle the number(s) against the response(s) that you choose as correct for each question. Certain questions have only one correct response. Other questions have more than one correct response. In such cases, please be sure that you have considered all possible responses.

A. Definitions

Match concepts with their definitions by placing against each definition the number of the concept that is best described by that definition.

1.	Acclimatization	( ) Degree of association of successive performances
2.	Adaptation	( ) A group of nutrients determined by chemical methods
3.	Digestion	( ) Breakdown of complex to simple nutrients
4.	Enzyme	( ) An organic substance which catalyzes biochemical reactions
5.	Feed Conversion	( ) Feed intake per unit of economic performance
6.	Feed Efficiency	( ) An index of animal ability to utilize feed
7.	Homeostasis	( ) Essential amino-acid balance
8.	Hormone	( ) An organic substance which regulates biochemical reactions
9.	Inbreeding	( ) Biochemical changes associated with the physiological utilization of nutrients
10.	Metabolism	( ) Long-term adjustment to climatic stressors
11.	Nitrogen-Free-Extract	( ) A physiological response to the environment
12.	Protein Quality	( ) Maintenance of internal dynamic equilibrium
13.	Repeatability	( ) Mating of closely related individuals

A. Definitions (continued)

14. Selection	( ) Creation of a differential reproduction rate
15. Stress	( ) Physiological, genetic and/or productive adjustment to stress conditions

B. Cause-Effect Relationships

In dairy production, certain phenomena are caused by specific, identifiable factors. In the following set of cause-effect relationships, indicate against each effect the factor which directly or indirectly causes it by recording the number of the factor/cause in the parentheses.

Factor/Cause		Effect
1.	Crossbreeding	( ) Reduced Fertility
2.	Energy Lack	( ) Hybrid Vigor
3.	Excitement	( ) Slower Genetic Progress
4.	Feed Conversion Efficiency	( ) Uric Acid in Urine
5.	High Crude Fiber	( ) Excess Adrenalin
6.	Inbreeding Depression	( ) Reduced Metabolism
7.	Irregular Cycling	( ) Xerophthalmia
8.	Magnesium Deficiency	( ) Ketosis
9.	MGA	( ) Tetany
10.	Negative Nitrogen Balance	( ) Estrus Synchronization
11.	Production Records	( ) Impaired Sperm Motility
12.	Lowered Thyroid Activity	( ) More Services per Conception
13.	Simultaneous Selection	( ) Increased Heat Production
14.	Temperature Shock	( ) Low Feed Cost
15.	Vitamin A Deficiency	( ) Management Control

C. General Subject Matter

1. When we look at an animal's record, we appraise its performance and make judgements about its breeding value. We then use statistical methods to analyze the data. Indicate the three most important statistical measures which are used in the analysis.

   1) Covariance
   2) Mean
   3) Median
   4) Mode
   5) Variance

2. In animal breeding, the relationship P = G + E + GE stands for:

   P = _____

   G = _____

   E = _____

   GE = _____

3. Heritability is an important concept. It tells us how much of the difference observed in a trait, such as milk yield, is inherited. Indicate the two most important uses of this concept from the alternatives below:

   1) To calculate the variation due to all genetic causes
   2) To choose the best selection methods
   3) To predict how the progeny will perform
   4) To predict how an animal will perform in the future.

4. For a trait like fertility, which has a low heritability, the best criterion of selection is the performance of:

   1) Full-sibs
   2) Half-sibs
   3) Individual
   4) Individual and sibs

5. When we select for a trait like feed intake, but we are actually interested in improving a second trait, such as growth rate, the method of selection is known as:

   1) Combined
   2) Correlated
   3) Indirect
   4) Simultaneous

6. Close inbreeding has the greatest adverse effect on:

   1) Birth weight
   2) Disease resistance
   3) Growth rate
   4) Fat percent
   5) Milk yield
   6) Reproductive efficiency

7. While planning a housing system to reduce climatic stress on dairy animals, the two most important considerations are:

   1) Barometric pressure
   2) Direct solar radiation
   3) Photo period
   4) Rainfall
   5) Relative humidity
   6) Temperature
   7) Wind velocity
   8) Wind direction
   9) 24-hour maximum-minimum temperature

8. When a chemist analyzes a feed, he determines:

   1) Crude fiber
   2) Digestible protein
   3) Digestibility
   4) Ether extract
   5) Gross energy
   6) Minerals
   7) Moisture
   8) Nitrogen-free-extract

9. The digestibility of a feed depends upon:

   1) Caloric value
   2) Crude fiber content
   3) Dry matter content
   4) Feed preparation
   5) Minerals
   6) Moisture
   7) Protein content
   8) Stage of maturity at harvest

10. When a first-calf heifer is in energy balance, it:

    1) is consuming sufficient energy for tissue development.
    2) is receiving all essential nutrients in the required amounts.
    3) is gaining weight.
    4) is consuming sufficient energy to meet the needs for growth and milk.
    5) is giving optimum milk, but losing weight.

11. The National Research Council requirements for lactating cows calls for:

Crude Protein	Energy (Therms/100 lb. feed)
1) 10%	1) 40
2) 12%	2) 50
3) 13-14%	3) 60
4) 16%	4) 70

12. When an animal is in optimum condition and produces according to her potential without regression, she is said to be in:

    1) Energy balance
    2) Homeostasis
    3) Nitrogen balance
    4) Nutritional balance
    5) Stress

13. A dairyman can be advised to adopt a Complete Feeds program when he has one of the following conditions, which is most critical:

    1) Automated silage facilities
    2) Energy intake problems
    3) Labor problems

14. Challenge feeding should be recommended to a dairyman who has:

1) More than 50 adult cows in herd

2) At least 50 percent of cows producing over 40 lb. of milk daily

3) Energy intake problems

4) Labor trouble

5) Any size of herd

6) Any level of production

15. A dairyman feeds the following ration to his Holstein cows, which range in milk production from 30 to 80 lb. per day, and have an average bodyweight of 1000 lb.

Roughage (per cow)

1)	Corn silage	50 lb.
2)	Alfalfa hay	5 lb.

Concentrate Mixture (Ingredients per ton-fed @ 1 lb. to 2-1/2 lb. milk)

1)	Corn (9% CP)	1400 lb.
2)	Soybean oil meal (44% CP)	90 lb.
3)	Cottonseed meal (41% CP)	90 lb.
4)	Molasses (3% CP)	200 lb.
5)	Urea (282% CP)	80 lb.
6)	Wheat bran (12% CP)	100 lb.
7)	Salt	20 lb.
8)	Steamed bonemeal	20 lb.
		2000 lb.

Supplements

1) Vitamin A

2) Trace mineral salt

15.1 Is the proportion of urea in the concentrate mixture within the recommended limits?

Ingredient	% Protein	Lb. Protein in Concentrate
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
	TOTAL	_____

1) Urea level recommended _____ percent.

2) Urea level in concentrate _____ percent.

3) Conclusion--High/Normal/Low urea level.

15.2 If soybean oil meal and cottonseed meal cost the same, would there be advantage in terms of protein quality if we use:

	Advantage	No Advantage
1) Soybean oil meal alone.	_____	_____
2) Cottonseed meal alone.	_____	_____
3) Soybean oil meal and cottonseed meal.	_____	_____

15.3 Is the dairyman justified in using Vitamin A supplement?

1) Yes _____

2) No _____

Why _____

_____

15.4 Is the dairyman justified in using trace mineral salt?

1) Yes _____

2) No _____

Why _____

_____

APPENDIX B

RANKING OF DAIRY SCIENCE CONCEPTS ON MEAN IMPORTANCE RATINGS IN THE WORK OF DAIRY AGENTS BY DISCIPLINE ACCORDING TO TYPE OF EXTENSION PROFESSIONAL, LOUISIANA, 1971

Agents and Specialists	Parish Agents	Area Agents	Specialists
BREEDING CONCEPTS			
Breeding Efficiency	Artificial Insemination	Breeding Efficiency	Breeding Efficiency
Heritability	Heritability	Artificial Insemination	Heritability
Artificial Insemination	Breeding Efficiency	Hormones	Selection
Hormones	Hormones	Heritability	Hormones
Selection	Mating Systems	Selection	Mating Systems
Mating Systems	Selection	Mating Systems	Artificial Insemination
NUTRITION CONCEPTS			
Balancing Rations	Balancing Rations	Balancing Rations	Feeding Standards
Feeding Standards	Feeding Standards	Feeding Standards	Feeding Management
Feed Evaluation Systems	Feed Evaluation Systems	Feed Efficiency	Feed Evaluation Systems
Feed Efficiency	Feed Efficiency	Feed Evaluation Systems	Balancing Rations
Feeding Management	Nutrient(s) Absorption	Feeding Management	Feed Efficiency
Nutrient(s) Absorption	Nutrient(s) Metabolism	Nutrient(s) Absorption	Ruminant Digestion
Nutrient(s) Metabolism	Feeding Management	Nutrient(s) Metabolism	Nutrient(s) Absorption
Ruminant Digestion	Ruminant Digestion	Ruminant Digestion	Nutrient(s) Metabolism

(continued)

APPENDIX B (continued)

Agents and Specialists	Parish Agents	Area Agents	Specialists
MANAGEMENT CONCEPTS			
Milk Quality	Milk Quality	Herd Health	Milk Quality
Dairy Records	Dairy Records	Dairy Records	Dairy Records
Herd Health	Herd Health	Dairy Sanitation	Milking Management
Milking Management	Dairy Buildings/Facilities	Milk Quality	Herd Health
Dairy Buildings/Facilities	Herd Replacements	Milking Management	Herd Replacements
Herd Replacements	Milking Management	Effects of Stresses	DHIA Management
Dairy Sanitation	Effects of Stresses	Dairy Buildings/Facilities	Dairy Buildings/Facilities
Effects of Stresses	Sire Selection	DHIA Management	Effects of Stresses
DHIA Management	Dairy Sanitation	Herd Replacements	Dairy Sanitation
Sire Selection	DHIA Management	Sire Selection	Sire Selection
Adaptation	Adaptation	Adaptation	Adaptation

VITA

Satish Verma was born on September 21, 1930, in Bangalore, India.

He completed high school under the University of Cambridge instruction system from the Cambridge School, Delhi, in 1945. He entered the Delhi University and received the degree of Bachelor of Science in 1950. The following year, 1951, he received the Diploma in Journalism offered by the Punjab University.

In 1952, he was employed in the Information Department of the Indian Council of Agricultural Research, New Delhi. He resigned in 1955 to study for the two-year Diploma in Dairying at the Southern Regional Station of the National Dairy Research Institute, Bangalore.

In September, 1957, he was employed as Technical Assistant in the National Dairy Research Institute, Karnal. Subsequent positions with the National Dairy Research Institute included Exhibition Officer and Assistant Research Officer (Extension). He accepted the position of Research Officer (Extension) in January, 1962.

In June, 1964, he was deputed by the Government of India under the Fellowship Program of the Food and Agriculture Organization of the United Nations for advanced training in dairy extension at the Louisiana State University, and obtained the Master's degree in

Agricultural Extension Education in August, 1965.

Upon return to India, he continued to work with the National Dairy Research Institute for four years. In September, 1969, he took leave of absence to enroll for the Doctorate in Extension Education at the Louisiana State University.

He is married to Nirmala Wahi. They have a daughter, Madhu, aged 11, and a son, Mukul, aged 9.